

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 : 07-01-2026

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 are archaeobacteria? What is their significance?
 - b) Draw a labeled diagram depicting the basic structure of an animal virus.
 - c) How does medium pH influence the growth of a microbe?
 - d) What is the significance of lag phase in the growth cycle of a microbe?
 - e) What is commensalism? Give an example.
 - f) What is the significance of quorum sensing in bacteria?
 - g) What are secondary metabolites?
 - h) What is a chemostat?
 - i) What are beta lactam antibiotics? What is their effect?
 - j) What are random mutants? What is their significance?

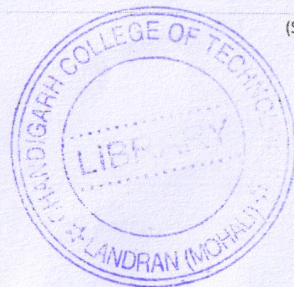
SECTION - B

2. Describe the structure and function of yeast.
3. Discuss the growth kinetics of bacteria in a fed-batch culture.
4. What are the factors affecting virulence of a microbe?
5. Explain the fermentative production of an organic acid.
6. Discuss the nutritional requirements of a bacterial culture.
7. How is media sterilized? Explain.
8. Write a note on host-pathogen interactions.

SECTION - C

9. Discuss the importance of microbes in health and food.
10. Describe the energetics of aerobic respiration.
11. Write a note on strain improvement techniques.

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M.Sc.(BT)(Sem.-1)
GENETICS AND MOLECULAR BIOLOGY

Subject Code : MBT-103

M.Code : 75661

Date of Examination : 15-01-2026

Time : 3 Hrs.

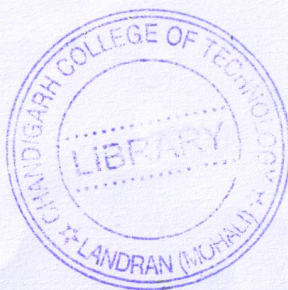
Max. Marks : 70

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. Write briefly:
- a) Genomic imprinting
 - b) Application of tetrad analysis.
 - c) Linkage maps and their use.
 - d) Differentiate between inversion and translocation.
 - e) Insertional mutagenesis.
 - f) Cot curve
 - g) Spliceosome and its function.
 - h) Okazaki fragments
 - i) Characteristics of genetic code.
 - j) mRNA and its functions.



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SECTION - B

2. What is pedigree analysis? How it is done and write its applications?
3. Explain the concept of polygenic inheritance and how it differs from Mendelian genetics?
4. Describe methods for measuring heritability.
5. Compare and contrast germinal and somatic mutants, providing examples.
6. What are transcriptional factors and how do they work?
7. Explain the organization of eukaryotic chromosomes and the role of chromatin structure.
8. Compare and contrast replication in Prokaryotes and Eukaryotes.

SECTION - C

9. Explain the phenomena of pleiotropy and genomic imprinting in genetic inheritance.
10. Define splicing and discuss it in mRNA and tRNA.
11. **Write short notes on the following:**
 - a) Importance of crossing over in genetic recombination.
 - b) Role of genes in gene mapping.

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Master of Science (Bio Technology)(Sem.-1)

COMPUTER APPLICATIONS

Subject Code : MBT-105

M.Code : 75663

Date of Examination:09-01-2026

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) What is the main function of a computer's CPU?
- b) What does binary representation use to encode data?
- c) Name two types of system software.
- d) What is the main purpose of the #include directive in C++?
- e) How do you declare a template function in C++?
- f) What operator is used to increment a variable in C++?
- g) Define a cell in the context of a spreadsheet.
- h) What is the difference between = = and = operators in C++?
- i) How do you bold text in a word processing document?
- j) What is a class in object-oriented programming?

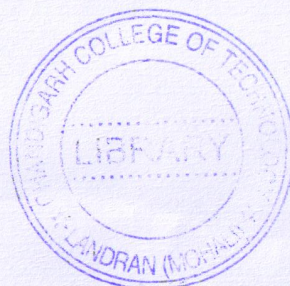
SECTION-B

2. Describe how the binary number system works and why it is used in computers? Include a comparison with the decimal system.
3. Discuss the role of an operating system in managing computer hardware and software resources. How does it facilitate communication between hardware and application software?
4. Write the principles of generic programming in C++. How do templates enable generic programming? Provide an example of a template class.
5. Explain the difference between 'if' and 'switch' control structures in C++. Provide an example of when each might be used?
6. How can you concatenate two strings, find the length of a string, and compare two strings? Provide code examples to illustrate these operations.
7. Discuss the difference between function overloading and operator overloading in C++. Provide examples to illustrate how each is implemented?
8. Explain the difference between a word processing document and a spreadsheet. Provide examples of typical use cases for each.

SECTION-C

9. Explain classes and objects in C++ as the foundation of object-oriented programming. Discuss how to define a class, create objects and use access specifiers (public, private, and protected)? Provide detailed examples of constructors, destructors, member functions and how to use 'this' pointer?
10. Write a detailed explanation of control structures in C++, including sequence, selection, and iteration. Describe how each type of control structure affects the flow of a program. Provide code examples for each type, illustrating how they are used to solve common programming problems? Discuss best practices for using control structures to write clear and efficient code.
11. Describe in detail the process of data representation in binary, including how different types of data (e.g., integers, characters, floating-point numbers) are encoded? Explain the importance of data representation in computing and discuss common encoding schemes such as ASCII and Unicode. Additionally, illustrate the conversion process between binary and other number systems.

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Master of Science (Bio Technology) (Sem.-1)

ENVIRONMENT BIOTECHNOLOGY

Subject Code : MBT-111

M.Code : 75664

Date of Examination : 17-01-2026

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 FIVE marks each and students have to attempt any SIX questions.
3. SECTION-C contains THREE questions with internal choice carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Describe briefly:

- a) Define vermiculture.
- b) What is BOD and COD of waste water?
- c) What are aerated lagoons? How do they differ from oxidation ponds?
- d) What are volatile organic compounds? What are the major sources of VOC in air?
- e) Name any two water borne infections and their cause.
- f) What is composting?
- g) What are bio-surfactants?
- h) How are algae helpful in bioremediation?
- i) What is the composition of dairy waste?
- j) Name the major biomass sources of energy.

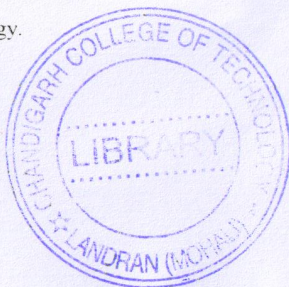
SECTION - B

2. Describe the parameters for pollution monitoring.
3. Write a note on metagenomic approaches in remediation of environmental pollution.
4. What are rotating biological contactors? How do they work? Explain with the help of a diagram.
5. Draw an outline of effluent treatment plant. How is municipal waste treated? Explain.
6. Write a note on remediation of agro-waste and agricultural chemicals.
7. What are biofuels? How are they produced? Discuss the status of biofuel-production and use in India.
8. Write note on microbial leaching.

SECTION - C

9. Describe the innovative techniques for pollution abatement.
10. Discuss the technologies for treatment of pharmaceutical industry waste.
11. What is organic farming? Discuss the methods and goals of organic farming.

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

Subject Code : MBT-112

M.Code : 75665

Date of Examination : 12-01-2026

Time : 3 Hrs.

Max. Marks : 70

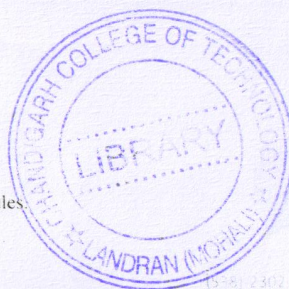
INSTRUCTIONS TO CANDIDATES :

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 :

- a) Nanoparticles
- b) Carbon nanotubes
- c) DNA oligomers
- d) Magnetosomes
- e) Bimolecular sensing
- f) Polymer nano-containers
- g) Nano-bioelectronic devices
- h) Electrostatic properties of DNA.
- i) Nanotechnology in smart packaging.
- j) Buckyballs interface with biological macromolecules.



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SECTION - B

2. What are functional properties of biomaterials?
3. Write about microbial production of inorganic nanoparticles.
4. Write down about proteins as transducers and amplifiers of biomolecular recognition events.
5. Give an account of modification of DNA for nano-technological applications.
6. Write a short note on impact of nano-materials in biological processes.
7. How insecticides are developed with the help of nanotechnology?
8. Explain the role of nano-technology in toxin and contaminant detection.

SECTION - C

9. Write down about opportunities and promises of nano biotechnology.
10. Explain DNA based nanostructures along with their applications.
11. Give a detailed account of role of nanotechnology in Food technology.

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

IMMUNOLOGY AND IMMUNOTECHNOLOGY

Subject Code : MBT-202

M.Code :76246

Date of Examination:05-12-2025

Time : 3 Hrs.

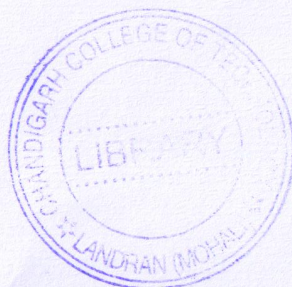
Max. Marks : 70

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) Memory cell
 - b) Constant region of antibody.
 - c) CD4 +cells
 - d) Lymphoid tissue
 - e) Antibody titer
 - f) Tumor antigens
 - g) Precipitation technique
 - h) Autoimmunity
 - i) T-cell activation
 - j) Blast formation



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SECTION - B

2. Draw and describe the molecular structure of antibodies.
3. What is antibody diversity and how it is generated?
4. Differentiate between organ specific and systemic autoimmunity.
5. Explain different types of cancer immunotherapies.
6. Discuss in detail hybridoma technology.
7. Explain the principle and application of Enzyme linked assays.
8. What are the application of studying immunocytochemistry and immunohistochemistry?

SECTION - C

9. Discuss rearrangement of immunoglobulin genes and their role in class switching.
10. Discuss structure and function of class II MHC molecule.
11. What are immunosuppressive drugs? Explain the mechanism of immunosuppressive therapy.

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Total No. of Questions : 11

Total No. of Pages : 02

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

Subject Code : MBT-203

M.Code : 76247

Date of Examination : 08-12-2025

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. Describe briefly :

- What is the active site of an enzyme?
- Define Michaelis-Menten constant.
- What are coenzymes? What is their role in modulating enzyme activity?
- What is noncompetitive inhibition of enzyme activity?
- What are multienzymes?
- Define monomeric and oligomeric enzymes.
- How does pH effect enzyme activity?
- How covalent modifications help to regulate activity of enzymes?
- What are metalloenzymes? Give example.
- What is the role of proteases in food industry?

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SECTION-B

2. Describe the structure of enzymes.
3. What are the different classes of enzymes? Describe their functions and give examples of each class.
4. How do enzymes reduce activation energy of a reaction? Explain.
5. Write a note on enzyme inhibition.
6. With the help of an example, describe the methods for investigation of mechanism of enzyme-catalysed reactions.
7. What are allosteric enzymes? Describe their role in cellular metabolism.
8. Discuss the applications of enzymes in medical diagnosis and treatment.

SECTION-C

9. How can enzymes be immobilized? Explain the industrial applications of immobilized enzymes.
10. Explain the factors affecting rate of enzyme-catalysed reactions.
11. Discuss the kinetics of single substrate enzyme catalysed reactions.

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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:02-12-2025

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:

- Define Polymerase Chain Reaction (PCR). How can you design primers for PCR?
- What is the difference between RNAi and siRNA?
- Define transfection.
- Define microarray technology.
- Differentiate between genomic and cDNA libraries
- Write one application of SV40 vector in animal cells.
- Define shuttle vectors with an example.
- Differentiate sticky and blunt ends.
- What is the role of linkers and adaptors in cloning?
- DNase I footprinting.

SECTION - B

2. Discuss different types of restriction enzymes used in genetic engineering with examples.
3. Describe the features of pUC 19 plasmid and its significance.
4. Give methods of protein purification.
5. Give physical methods of gene transfer.
6. Discuss the process of library screening using probes.
7. What is DNA sequencing? Describe the process of pyrosequencing.
8. Explain the formation of cDNA libraries.

SECTION - C

9. Explain in detail the role of site directed mutagenesis and its role in protein-engineering.
10. What are expression vectors? Give their design, regulatory elements and applications in protein production.
11. Explain in detail the strategies used for the production of transgenic plants with examples of their applications in agriculture and medicines.

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

BIOSTATISTICS

Subject Code : MBT-302

M.Code : 76729

Date of Examination : 04-12-2025

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) Uses of goodness of fit.
- b) Difference between mean and standard deviation.
- c) Applications of normal distribution.
- d) Biostatistics
- e) Sampling techniques
- f) Completely randomized block design.
- g) Importance of biostatistics in biotechnology.
- h) Difference between qualitative and quantitative data.
- i) Nonparametric tests
- j) Scatter diagrams

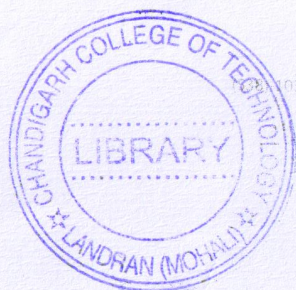
SECTION - B

2. What are measures used for central tendency and write its equations and-terms?
3. Explain graphical representation of ungrouped data in detail.
4. Explain F-test for goodness of fit in detail.
5. Define ANOVA. What is the use of one-way ANOVA? Give an example.
6. Define regression lines and regression co-efficient. Explain in detail various methods used to study regression.
7. Differentiate between probability mass function and cumulative distribution function.
8. What are complete and incomplete block designs? Explain CRD in detail.

SECTION - C

9.
 - a) Describe general procedure for testing of hypothesis.
 - b) Differentiate between type-I and type-II errors.
10. Write the procedure for determination of sample size for simple experiments.
11. Explain the various characteristics and methods of measurement of central tendency.

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Total No. of Pages : 02

Total No. of Questions : 11

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

Subject Code : MBT-303

M.Code :76730

Date of Examination:06-12-2025

Time : 3 Hrs.

Max. Marks : 70

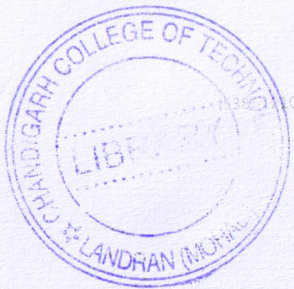
INSTRUCTIONS TO CANDIDATES :

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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. Write briefly:
- What are conserved and consensus sequences?
 - Applications of SAGE.
 - SNPs
 - Proteomics and proteome
 - Analytical proteins separation
 - Tandem mass spectrometry
 - Genome expression profiles
 - Protein-protein interactions
 - Methods of mapping protein modification.
 - Mass finger printing

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SECTION- B

2. How does natural selection influence the evolution of genomes?
3. How do prokaryotes and eukaryotes differ in the organization of their metabolic pathways and cellular processes?
4. What is the importance of protein databases? Explain any two databases.
5. Describe two methods of generating ESTs.
6. What are the fundamental principles of mass spectrometry and how is it used in chemical analysis?
7. How do post-translational modifications influence protein-protein interactions and their dynamics?
8. What are the advantages and limitations of using chemical methods for protein digestion compared to enzymatic digestion?

SECTION-C

9. Explain transcriptome analysis and SNP analysis in detail.
10. How do comparative genomics and functional genomics complement each other in understanding gene evolution and function and give main approaches used in comparative genomics to study genome evolution across different species?
11. What do you mean by microarray? Give its types along with principle, methods and applications?

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Total No. of Questions : 11

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M.Sc. (BT)(Sem.-3)
CLINICAL RESEARCH
Subject Code : MBT-313
M.Code : 76735

Date of Examination : 11-12-2025

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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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. Write briefly :
 - a. Enlist major objectives of phase 0 clinical trials.
 - b. Define post marketing surveillance.
 - c. Expand and define the term ICH GCP.
 - d. Enlist major ethical issues in conduct of clinical trials.
 - e. Define clinical research and clinical practice.
 - f. Define placebo. Write two major disadvantages of using placebo.
 - g. Define investigator's brochure.
 - h. Enlist important components of informed consent form.
 - i. Define clinical trial protocol.
 - j. Describe the basic role of DCGI in regulating clinical trials in India.

SECTION-B

2. Describe the role of ICMR in conducting biomedical research on human participants.
3. Describe the Indian and global scenario of Pharmaceutical Business.
4. Describe the core principles of ICH-GCP.
5. Describe the methods of conducting phase-IV clinical trials.
6. Describe the research ethics for qualitative clinical research studies.
7. Describe various methods of conducting post marketing surveillance studies.
8. Briefly describe the history of ICH.

SECTION-C

9. Describe in detail the various types and phases of clinical research.
10. **Write short note on the following:**
 - a) Clinical trial market
 - b) Origin and history of clinical research
 - c) Essential documents for the conduct of clinical trial.
11. Describe the content of clinical trial protocol and explain various causes of protocol amendments.

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M.Sc (Biotechnology) (Sem-3)
IPR, GOOD LAB PRACTICES AND BIOETHICS

Subject Code : MBT-304

M.Code : 76731

Date of Examination : 09-12-2025

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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SECTION-A

1. Write briefly:

- a) What are the basic requisites of patentability?
- b) Give two examples of non-patentable inventions.
- c) Define Patents and Trademarks
- d) Define Creativity and Novelty
- e) Discuss essential elements of IPR.
- f) What is the role of TRIPS in patent protection?
- g) List patent offices in India.
- h) What are the main safety features of biosafety-2 lab?
- i) Write a note on bioethics.
- j) Discuss the safety measures to handle radioisotopes and biochemicals in lab.

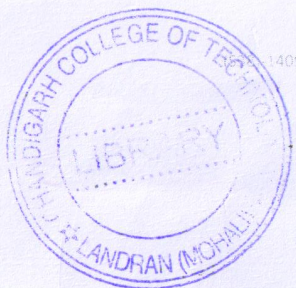
SECTION - B

2. Explain the various issues in biotechnology patents in context to cell lines and plant varieties.
3. Mention types of IPR. Describe all the stages from filing to grant of patents.
4. What is patentable in Biotechnology? How to file patent application in India?
5. What is TKDL? Explain its purpose, structure and possible risks in detail.
6. Explain the various ethical issues in patenting, publishing research findings and determining authorship in academic publications?
7. Discuss the importance of biosafety in preventing laboratory-acquired infections and ensuring environmental and public safety.
8. Discuss the core principles of GLP and how they ensure data integrity, reproducibility, and regulatory compliance?

SECTION - C

9. What is a patent search and why is it an essential step in the process of innovation and patent filling? Explain the different types of patent searches and the databases commonly used to conduct them.
10. Discuss the role, structure, and functions of WIPO. How does WIPO contribute to the protection of IPRs at the global level? Explain the major treaties administered by WIPO?
11. Define contamination and discuss the various levels of contamination encountered in laboratory. Explain how these levels are classified, measured and controlled?

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Total No. of Questions : 11

Subject Code : MBT 312

M.Code :76734

Date of Examination : 11-12-2025

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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SECTION-A

1. Write briefly:
- Write the uses of citric acid.
 - Name two microbial sources of food colorants.
 - What is the mode of action of nisin?
 - Define nutraceuticals.
 - Name any two functional foods available in market.
 - What is directed evolution?
 - What are complex foods?
 - List two micronutrients that should be incorporated into our diet. Also, state their effect.
 - Describe the uses of xanthan gums.
 - What is the source of vanillin flavour?

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SECTION - B

2. Describe the applications of biosensors in food processing.
3. Write a note on protein engineering in food technology.
4. What are the markers for development of functional food?
5. Describe the different classes of nutraceuticals.
6. Write a note on production of bioflavours.
7. What is the scope and importance of gene-diet interactions?
8. What is the physiological effect of complex food?

SECTION - C

9. What is the role of biotechnology in quality assessment and ensuring food safety?
10. Discuss the effect of transporter gene polymorphism in food processing and nutrigenomics.
11. Discuss the fermentative production of organic acids. State their uses.

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

Subject Code : MBT-203

M.Code : 76247

Date of Examination : 22-05-2025

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. Describe the following :

- a) How ligases differ from lyases?
- b) How does the structure of oligomeric enzymes contribute to their function and regulation?
- c) Explain how substrate concentration affects the activity of enzymes.
- d) What is the International Unit (IU) system of enzymes?
- e) How temperature and pH affect the activity of enzymes?
- f) What are co-enzymes?
- g) How are enzymes used in the treatment of diseases?
- h) What is the difference between homotropic and heterotropic cooperativity?
- i) What is sub-cellular compartmentalization?
- j) How are enzymes used in food processing?

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SECTION - B

2. How do co-factors and co-enzymes affect enzyme structure and function?
3. How does the Lineweaver-Burk plot provide insights into enzyme kinetics?
4. Compare and contrast the kinetic properties and regulatory mechanisms of lactate dehydrogenase and lactate synthetase.
5. What are the main methods of enzyme immobilization?
6. Describe the role of enzymes in food and beverage production.
7. What are the key assumptions made in steady-state enzyme kinetics?
8. What is the role of substrate specificity in enzyme structure?

SECTION - C

9. What are the principle, advantages and limitations of each model in explaining enzyme-substrate interactions and catalytic mechanisms?
10. How do models like the Monod-Wyman-Changeux and sequential model differ in their explanation of allosteric regulation and cooperativity?
11. Explain the distinguishing features and mechanisms of main types of enzyme inhibition along with the examples.

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Total No. of Pages : 02

Total No. of Questions : 11

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

Subject Code : MBT-205

M.Code : 76249

Date of Examination : 26-05-2025

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. Describe briefly :

- a) Batch and fed batch fermentation.
- b) Principle of centrifugation.
- c) Reverse osmosis and its uses.
- d) Pasteurization
- e) Crystallization
- f) Role of baffles in fermenter.
- g) Biocolors
- h) Catabolite repression
- i) Synchronous culture
- j) Role of Biosensors in bioprocessing.

SECTION - B

2. What are pneumatic and hydrodynamic fermenters.
3. Describe the concept of solid, surface and submerged fermentations.
4. What is Reverse osmosis and explain its applications in bioseparation processes.
5. Describe the concept and significance of dissolved oxygen in bioreactor processes.
6. Discuss about various sterilization techniques used to sterilized media and equipment at industry level.
7. Explain the concept of microbial growth and death kinetics with the help of diagram.
8. Write a note on bacteriocin production and its applications.

SECTION - C

9. Describe various microbial based methods used for treatment of effluents.
10. What do you mean by inline, online and offline measurements? Write about various methods and equipment used for measurement and control of bioprocess parameters.
11. Write a detailed note on the following :
 - a) Scope of starch-based waste products for their conversion to useful products.
 - b) Purification by chromatographic techniques.

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M.Sc. Biotechnology (Sem.-2)

PLANT TISSUE CULTURE

Subject Code : MBT-211

M.Code : 76250

Date of Examination: 29-05-2025

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. Answer briefly:

- a) What are the sources of Protoplast?
- b) What is the role of antibiotics used in culture media in Plant Tissue Culture?
- c) What are the ethical considerations of Transgenic Plants?
- d) What are Elicitors? Give classification.
- e) What are the physiological effects of Ethylene (Plant Hormone)?
- f) What is the objective of Cryopreservation?
- g) What are the advantages and limitations of Somaclonal Variation?
- h) Where are Auxins synthesized in Plant?
- i) What is the purpose of Chromosome Elimination?
- j) What is Synthetic Seed?

SECTION - B

2. What are the different elements of Plant Tissue culture? Discuss the role of micronutrients and carbohydrates in culture media.
3. What are the types of Transgenic Plants? Give their future perspectives.
4. Describe biosynthesis of Gibberellins.
5. What are the causes of Somaclonal Variations?
6. What is the importance of Microspore Culture? Give its protocol, advantages and disadvantages.
7. Discuss 'Tissue Culture Technique for plant improvement'.
8. Write short notes on :
 - a) Diploid plants
 - b) Biotransformation.

SECTION-C

9. Describe various methods for *in vitro* production of secondary metabolites.
10. What are Plant Growth regulators? Give physiological effects and mechanism of actions of Auxins and Cytokinins.
11. What is Micropropagation process? Give its advantages, disadvantages and applications.

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M.Sc. Biotechnology (Sem.-2)
MOLECULAR CARCINOGENESIS & THERAPY

Subject Code : MBT-213

M.Code : 76252

Date of Examination: 03-06-2025

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

I. Answer briefly:

- a) Mention the role of retroviruses in cancer.
- b) What are Oncogenes?
- c) What are growth factors? Give examples.
- d) What is Hodgkin's disease?
- e) What are tumour suppressor proteins? Give examples.
- f) Highlight role Papiloma virus as cancer virus.
- g) What is bronchogenic carcinoma?
- h) What are H-ras & K-ras genes?
- i) What is erythropoietin?
- j) Mention any two human carcinogens.

SECTION-B

2. Explain the growth characteristics of cancer cells.
3. Write a note on chemical carcinogens.
4. Write a note on tumour suppressor gene p53 and its role in tumour development.
5. Add a note on mutation in proliferating cells.
6. Write a short note on gene therapy of cancer.
7. Add a note on cancer vaccines and their current status.
8. Give a brief account on multi-drug resistance and cancer chemotherapy.

SECTION - C

9. Discuss in detail about carcinogenesis.
10. What are the products of oncogenes? Mention their role in cancer progression.
11. Discuss chemotherapy of Hodgkin's disease and lymphosarcoma.

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

Subject Code : MBT-201

M.Code : 76245

Date of Examination : 05-05-2025

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. Attempt all parts:

- a) What are receptors?
- b) What is the site of lipid biosynthesis in eukaryotes?
- c) What is cot curve? What is its significance?
- d) What is necrosis? Which factors induce cell necrosis?
- e) Define differentiation, de-differentiation and re-differentiation.
- f) What are the key regulators for the development of symmetry in plants?
- g) Define gastrulation.
- h) What is malignant neoplasm?
- i) Draw a diagram depicting zygote formation in plant.
- j) Describe the structure and organization of shoot apex.

SECTION-B

2. Write a note on cell signalling pathway.
3. Describe the structure and function of Golgi apparatus.
4. Discuss the process of development of embryo sac in plants.
5. Explain the induction and differentiation of eye lens in vertebrates.
6. Write a note on structure and organization of chromosomes.
7. What is meant by pattern formation? Explain the process of pattern formation and cell aggregation in Drosophila.
8. Discuss the structure and function of plasma membrane.

SECTION-C

9. Describe organogenesis in context of vulva formation in Caenorhabditis elegans.
10. Write in detail the molecular organization and function of cytoskeletal elements.
11. **Write short notes on:**
 - a) Cell lineages
 - b) Programmed cell death.

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