S–4271	Sub. Code
	23MBT1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Biotechnology

BIOCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Acetic acid is known to have a pKa of 4.76. Determine the Ka for acetic acid.

2. What is glycogenolysis vs gluconeogenesis?

3. What is omega-3 and omega-6 fatty acids, why are these important?

4. Bile reflux

5. Gibbs free energy

6. How is Cori cycle and gluconeogenesis related?

7. Define Exotic proteins. Give an example for it.

8. Lysosomal proteolysis.

9. Draw the structure of purine bases.

10. Where does the enzyme GPA Tase involve?

Part B $(5 \times 5 = 25)$

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

11. (a) Comment a note on protein buffer system.

Or

(b) Outline the classification of carbohydrates.

12. (a) Differentiate between saturated and unsaturated fatty acids.

Or

(b) Brief about eicosanoids.

13. (a) Outline the oxidative phophorylation.

Or

(b) Summarize a note ketone bodies.

14. (a) Give an account on the conjugated and derived proteins.

Or

(b) What is the fate of carbon skeleton of amino acids? Explain.

15. (a) Brief about mRNA and rRNA with a diagram.

Or

(b) What are the synthetic analogues of nitrogenous bases?

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss a detailed account on the carbohydrate metabolism.

17. How does the biosynthesis of cholesterol differ from the biosynthesis of triglycerols? Explain.

18. Enumerate an account on the biological oxidation.

19. Describe the structure of protein with the diagram.

20. Elaborate a detailed note on the de novo and salvage synthesis of purine and pyrimidine bases.

———————

S–4272

Sub. Code
23MBT1C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Biotechnology

MOLECULAR GENETICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Exons

2. VNTR

3. Give any two examples of a mutagenic virus?

4. What is the mechanism of homologous recombination in prokaryotes?

5. What is double-strand break and single-strand break?

6. Why was it important that McClintock used self-fertilized kernels in her experiments?

7. How does gene frequency differ from genotype frequency?

8. Cytogenetic Mapping

9. What is the rep ABC plasmid family?

10. How does Ori controls copy number?

Part B $(5 \times 5 = 25)$

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

11. (a) Differentiate introns and exons.

Or

(b) Comment on microsatellites.

12. (a) Give a note on radiation induced mutation.

Or

(b) Brief about chromosomal abnormalities.

13. (a) Summarize a note on DNA damages.

Or

(b) Write a detailed note on excision repair and SOS repair.

14. (a) Explain Hardy – Weinberg principle.

Or

(b) Comment a note on chromosome mapping.

15. (a) Mention the types and structures of F.RTH.col factors.

Or

(b) Differentiate between natural and artificial plasmid transfers.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Give a detailed account on DNA Markers and its detection techniques.

17. Compare the gene regulations between prokaryotes and eukaryotes with a diagram.

18. Explain the various different DNA damages with the diagram.

19. Enumerate an account on random mating types and its special cases involved.

20. Define extra chromosomal heredity. Explain in detail on the biology of plasmids and their discovery.

———————

S–4273

Sub. Code
23MBT1C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Biotechnology

MOLECULAR CELL BIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Enlist the components of Cellular Matrix.
2. What is gap junction?
3. What is endosymbiotic theory?
4. Brief the structure of Deoxyribonucleic acid.
5. What is a replication fork?
6. Comment on the Nuclear envelope.
7. Describe the role of MAP kinase in cell signaling.
8. What is the role of cell cycle checkpoints in cell division.
9. Differentiate oncogenes and proto-oncogenes.
10. What is the function of Rb gene?

Part B (5 × 5 = 25)

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

11. (a) Describe the phase contrast microscope with a diagrammatic representation.

Or

(b) Write a note on active and passive transport.

12. (a) Explain in brief about the post-translational modifications of proteins.

Or

(b) Elaborate the structure and function of the nucleus.

13. (a) Brief Solenoid and zig-zag model.

Or

(b) Justify the nucleus as the "control center of the cell" and describe its structure.

14. (a) What are the different types of cell signaling?

Or

(b) Write about any five signal transductional pathways.

15. (a) Write about the genes involved in tumor suppression.

Or

(b) What is apoptosis and write down the significance of apoptosis?

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Describe the principle, mechanism and applications of scanning electron microscopy with a diagrammatic representation.

17. Explain in detail about the process and stages of DNA replication.

18. What is a giant chromosome and explain in detail about the different types of giant chromosome?

19. Write in detail about the stages involved in the cell cycle.

20. What are the multi-stages in cancer development?

———————

S–4274

Sub. Code
23MBT1E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Biotechnology

Elective – BIOINSTRUMENTATION

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions

1. How does fluorescence differ from fluorophore?
2. What is the importance of phase contrast?
3. How is sedimentation coefficient calculated?
4. What is RT and RRT in HPLC?
5. What is the principle of isoelectric focusing?
6. Define DNA chip.
7. Westergren ESR.
8. Give any two applications of X-Ray spectroscopy.
9. What happens in Beta Decay?
10. What are the advantages of autoradiography?

Part B (5 × 5 = 25)

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

11. (a) Give the sample preparation steps involved in flow cytometry.

Or

(b) Brief about the working principle for phase contrast microscope.

12. (a) What is the principle of Density gradient centrifugation? Explain.

Or

(b) Explain the types of paper chromatography with the diagram.

13. (a) Describe the principle and applications of radioimmunoassay.

Or

(b) Give a note on 2D Gel electrophoresis.

14. (a) Explain the principles and methodology of UV - VIS spectroscopy.

Or

(b) Mention the applications of NMR.

15. (a) Give an account on uses and applications of radioisotopes.

Or

(b) Differentiate between solid and liquid scintillation counter.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain in detail about SEM. Add a note on the applications of it.

17. How proteins/enzymes are separated using based on the size? Explain.

18. Elucidate an account on ELISA.

19. Discuss on the principle, instrumentation and applications of NMR spectroscopy.

20. Enumerate an account on GM counter. Mention its applications.

———————

S–4276

Sub. Code
23MBT1E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

First Semester

Biotechnology

Elective – ENZYMOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions

1. Define liquid-liquid extraction.
2. Define enzyme nomenclature.
3. Name any two single substrate enzymes.
4. Give Hanes Wolf equation.
5. Define active site of an enzyme.
6. Name any two metalloenzymes and their metal cofactors.
7. Comment on complex enzymes.
8. Brief about the mode of action of chymotrypsin.
9. How coenzymes affect enzyme function?
10. What are reversible inhibitions?

Part B (5 × 5 = 25)

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

11. (a) Explain principle, and applications of Ion-exchange chromatography in enzyme purification.

Or

(b) How is the rate of an enzyme-catalyzed reaction influenced by substrate concentration, temperature and pH?

12. (a) What is a double reciprocal plot? How will you obtain it?

Or

(b) Discuss the limitations of Mechaelis-Menten constant.

13. (a) Explain group specific and steriospecific enzymes.

Or

(b) How proximity facilitates the catalysis? Explain.

14. (a) Explain the structural properties and mechanism of action of pyruvate dehydrogenase.

Or

(b) Explain the zymogen activation process in blood clot formation.

15. (a) What are enzyme biosensors? Explain the mechanism behind the use of enzymes in glucose determination.

Or

(b) Enzymes are clinical medicines - explain with any four examples.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Analyse the IUPAC classes of enzymes in primary metabolism involving glucose $\rightarrow$ pyruvate conversion with suitable systematic explanation.

17. Derive Mechaelis-Menten equation. How will you provide *Km* is the substrate concentration at a half-maximal velocity?

18. Differentiate competitive, non-competitive and uncompetitive inhibitors with suitable examples.

19. An enzyme has a *Km* of $3.7 \times 10^{-5}\ M$ and *Vmax* of $17\ \mu moles\ L^{-1}\ \min^{-1}$.

    What will be the velocity in the presence of substrate concentration of $2 \times 10^{-4}\ M$ and competitive inhibitor concentration of $4 \times 10^{-4} M$? $\left(Ki = 3 \times 10^{-4}\ M\right)$.

20. "Protein engineering is a method used for making desirable modifications on enzyme structure for broad substrate specificity". Discuss.

———————

S–4277

Sub. Code
23MBT2C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Biotechnology

MICROBIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions

1. What is *Leptospira* serovars?

2. How does methanogenic bacteria differ from acetogenic bacteria?

3. What is the database for 16s rRNA sequencing?

4. Define CFU.

5. What are the most commonly occurring bacterial phyla occurring in the human skin?

6. Define communicable disease with an example.

7. Give an account on Hansen's disease.

8. Write a note on the epidemiology of Zika virus.

9. Define Leg-hemoglobin.

10. *Azotobacter* an Ammonifying bacteria? Explain.

Part B (5 × 5 = 25)

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

11. (a) Write a note on bacterial taxonomy.

Or

(b) Differentiate between methanogenesis and acetogenesis with an example.

12. (a) How do you biochemically identify the Enterobacteriaceae family? Explain.

Or

(b) Give an account on scanning electron microscope.

13. (a) Brief about the microbiome of GI tract.

Or

(b) Differentiate parasitism mutualism with an example for each.

14. (a) Explain about the pathogenesis of TB.

Or

(b) Give an account on the general characteristic features of superficial mycosis.

15. (a) Illustrate the mechanism of N_2 fixation.

Or

(b) Mention the biotechnological applications of extremophiles.

Part C

$(3 \times 10 = 30)$

Answer any **all** questions.

16. Explain in detail on the microbial growth and factors affecting the growth of microbes.

17. Elucidate an account on sterilization.

18. What is an endophyte? Explain in detail about endophytism.

19. Compare the general characteristics, pathogenesis, laboratory diagnosis and control measures of Zika and Ebola virus.

20. Enumerate an account on carbon cycle with examples.

———————

S–4282

Sub. Code
23MBT2E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Second Semester

Biotechnology

Elective: ENVIRONMENTAL BIOTECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions

1. World Wildlife Fund.

2. Particular matter.

3. Source of inert biomass.

4. List out any three Soluble Microbial Products (SMP).

5. Role of skimming tanks.

6. Characteristics of an ideal disinfectant for wastewater treatment.

7. Chronic toxicity.

8. Ecological Indicator.

9. Bioventing.

10. Name any four methanogens.

Part B (5 × 5 = 25)

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

11. (a) Discuss in brief about the Wildlife (Protection) Act, 1972.

Or

(b) Write a note on microbial control strategies for oil spills.

12. (a) Explain any completely mixed batch reactor (CMBR) and its applications.

Or

(b) Simplify the mechanism of plug-flow reactor (PFR).

13. (a) Discuss the anaerobic biological wastewater treatment.

Or

(b) Explain the biological oxygen demand and its stages.

14. (a) Write a note on lethality (LC50 or LD50) tests.

Or

(b) Describe the role of biosensors in detecting the pollutants.

15. (a) Describe the degradation of waste by vermi composting.

Or

(b) Write a brief account on ex-situ bioremediation.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Write a detail account on sources, biological effects and control measures of radioactive pollution.

17. Write an essay on reactors and its engineering design with neat diagrams.

18. Describe the mechanism, types and factors affecting performance of trickling filter.

19. Elaborate the various methods of animal toxicology tests.

20. Describe the microbial degradation of petroleum hydrocarbons and pesticides with some examples.

———————

S–4284

Sub. Code
23MBT3C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Biotechnology

BIOINFORMATICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions

1. What are the four main components of a database?
2. Write the history PIR
3. What is BLASTA?
4. Define neural network.
5. Define Gene ontology.
6. Benefits of the protein interaction.
7. What are the two methods of phylogenetic analysis?
8. Define VAST.
9. Define RasMol
10. Expand of QSAR model.

Part B (5 × 5 = 25)

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

11. (a) Write short notes types of Protein database.

Or

(b) Overview bioinformatics scope and application.

12. (a) Short notes on sequence alignment on scored, Gaps and Gap Penalties.

Or

(b) Command on Dot matrix alignment.

13. (a) Discuss about the Hidden Markov Models.

Or

(b) Explain SCOP.

14. (a) Write notes on structural analysis tool: VAST and DALI.

Or

(b) Write about phylogenetic analysis.

15. (a) Describe the medical application of bioinformatics.

Or

(b) Short notes on QSAR Model.

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

Answer any **three** questions.

16. Brief introduction computational method and application protein-protein interaction.

17. Explain Drug designing tool for ADME approach.

18. Elaborate notes on Genome map and gene marker.

19. Explain working principle of microarray designing.

20. Describe about History, steps, Drug discovery.

———————

S–4285

Sub. Code
23MBT3C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Biotechnology

IMMUNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A (10 × 2 = 20)

Answer **all** the questions

1. Define FACS.
2. Why the agglutinations occur during the blood test?
3. What are the hypersensitivity reactions?
4. List the type of vaccine.
5. Write the role of MHC antigens in the immune response.
6. What is the role of immunology in cancer?
7. Define attenuation.
8. What are the idiotypic variants?
9. What is the function of lymphocytes?
10. What is graft in immunology?

Section B (5 × 5 = 25)

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

11. (a) Write the actions involved in passive and active immunity.

Or

(b) Describe the nature and biology of antigens and adjuvants.

12. (a) Mention about the functions of immunoglobulin super family.

Or

(b) List the various types of vaccine and its schedule.

13. (a) Demonstrate the function of HLA tissue typing.

Or

(b) Write about the generation of antibody diversity.

14. (a) How the macrophage activates during immune response?

Or

(b) Write about the VDRL test and RID.

15. (a) Explain the cell mediated cytotoxicity.

Or

(b) How to perform CMI techniques and immunotherapy?

Section C (3 × 10 = 30)

Answer any **three** questions.

16. Explain about the major response in tumor immunology.

17. Write the major biological functions of C proteins.

18. Explain the hypersensitivity reactions and its types.

19. Elaborate about the functions of EID and nephelometer.

20. Detail about the effectors mechanisms in immunity.

———————

S–4286

Sub. Code
23MBT3C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Biotechnology

BIOPROCESS TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions

1. Who introduced fermentation?
2. List out the applications of bioprocess technology.
3. Write the importance of fermentation.
4. How does pH affect fermentation?
5. What is the isolation and preservation method of bacteria?
6. What are the components of bioconversion?
7. What is the kinetics of an enzyme?
8. What is the difference between thermodynamic and kinetic stability?
9. Write the principle of chromatography.
10. Define yield coefficient.

Part B (5 × 5 = 25)

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

11. (a) Distinguish between upstream and downstream unit operations involved in bioprocess.

Or

(b) Short notes on the role of yeasts in fermentation processes.

12. (a) What ate the general conditions of fermentation?

Or

(b) Elaborate the fed batch culture in bioprocess technology.

13. (a) Illustrate the strain selection in fermentation.

Or

(b) Short notes on HACCP.

14. (a) How do you isolate industrially important microorganisms?

Or

(b) Describe about the Fluidized bed reactor.

15. (a) Mention briefly about the production of citric acid.

Or

(b) Describe about the difference between a bioreactor and a fermenter.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the composition and design of the fermentation medium.

17. Describe the process of fermentation in plants and animals cell bioreactors.

18. Enumerate the design and configuration of bioreactors.

19. Elaborate in detail about the types of microbial culture and its growth.

20. Discuss in detail about immobilization of cells and enzymes.

———————

S–4288

Sub. Code
23MBT3E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Biotechnology

Elective: MOLECULAR DEVELOPMENTAL BIOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions

1. Spermatogenesis.
2. Cell signals.
3. Sperm-egg recognition.
4. Nieuwkoop center.
5. Meroblastic.
6. Blastomers.
7. Fate maps.
8. Hematopoiesis.
9. Choroid fissure.
10. Myogensis.

Part B (5 × 5 = 25)

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

11. (a) Briefly explain about scope of development biology.

Or

(b) Write in detailed account on gametogenesis.

12. (a) Summaries the mechanism of fertilization.

Or

(b) Categories the role of the Spemann organizer.

13. (a) Describe the general principles of Cleavage.

Or

(b) Explain about the morphogenetic movements.

14. (a) Draw a neat diagram of formation of neural tube.

Or

(b) Compare the similarities of myogenesis and hematopoiesis.

15. (a) What are maternal effect genes in Drosophila?

Or

(b) Write the differentiation of photoreceptors in ommatidia.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Write a detailed account of structure of sperm and oocyte.

17. Explain about the mechanism of fertilization in mammals.

18. Identify the regulation of cleavage cycle.

19. Describe the development of vertebrate.

20. Discuss in detail about cyclopia.

———————

S–4289

Sub. Code
23MBT3S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2024

Third Semester

Biotechnology

GENE MANIPULATION TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions

1. Define rDNA.
2. What is autoradiography?
3. Write the difference between southern and western blotting technique.
4. Define YAC.
5. What is DNA microarray?
6. List out the types of mutation.
7. What is the use of reporter gene?
8. What are the products of transgenic plants?
9. How to construct the cDNA library?
10. Which type of plasmid contains virulent genes?

Part B (5 × 5 = 25)

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

11. (a) Describe the principle of agarose gel electrophoresis.

Or

(b) How to make the sticky ends of plasmids by using enzymes?

12. (a) Explain about the construction of DNA library.

Or

(b) Write the positive selection method and their applications.

13. (a) Discuss about the chromosomal walking.

Or

(b) Write the steps involved in human genome project.

14. (a) List out the merits and demerits of transgenic plants.

Or

(b) Mention the applications of the site direct mutagenesis.

15. (a) What are the bioethical roles followed in research labs?

Or

(b) Demonstrate the golden rice and its merits.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the PAGE and AGE with their applications.

17. Write the preparation of YAC library and its merits.

18. Detail about the applications of gene cloning.

19. Discuss the different types of plasmids using gene transformations.

20. Write about the various blotting techniques.

———————