**S–6720**

**Sub. Code**
**23MBC2C1**

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

**ENZYMOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** the questions.

1. What is Prosthetic group?

2. Specify the role of oxidoreductase.

3. Define Katal.

4. Outline the Isoenzymes.

5. Simplify KM.

6. Label any two examples for competitive inhibition.

7. Expand DDR.

8. Summarize the cumulative inhibition.

9. Illustrate the significance of adsorption in enzyme immobilization.

10. List any two therapeutic enzymes.

## Part B (5 × 5 = 25)

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

11. (a) Outline the importance of cofactors in enzyme activation.

Or

(b) Justify the chemical modifications of amino acid by site directed mutagenesis.

12. (a) Evaluate the importance of enzyme purification in industries.

Or

(b) How will you make use of Ion exchange chromatography in enzyme purification?

13. (a) Derive the Michaelis Menten equation and list its significance.

Or

(b) Analyse the substrate level inhibition with suitable examples.

14. (a) Elaborate the enzyme multiplicity with suitable example.

Or

(b) Explain Single Displacement reactions.

15. (a) Outline on ribozymes.

Or

(b) Discuss the merits and demerits of enzyme immobilization.

## Part C

(3 × 10 = 30)

Answer any **three** questions.

16. How coenzymes are essential for the function of enzyme?

17. Outline isoenzymes and their separation using electrophoresis.

18. Compare the competitive, uncompetitive and non-competitive inhibition.

19. Explain the MWC and KNF Model of allosteric enzymes.

20. Discuss in detail on the industrial importance of enzymes.

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| S–6721 |
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| Sub. Code |
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| 23MBC2C2 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

**CELLULAR METABOLISM**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** the questions.

1. Aerobic glycolysis.

2. Galactosemia.

3. Saturated fatty acids.

4. Prostaglandins.

5. Purine nucleotides.

6. *De novo* synthesis.

7. Essential amino acids.

8. Glucogenic amino acids.

9. Hunter syndrome.

10. Mucopolysaccharidoses.

## Part B (5 × 5 = 25)

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

11. (a) What is glycoxalate cycle, explain its regulation?

Or

(b) Give an account on blood glucose homeostasis.

12. (a) Give a brief account on the oxidation of fatty acids.

Or

(b) Explain regulation of $\beta$ oxidation.

13. (a) Write short notes on *De novo* synthesis.

Or

(b) What are purine and pyrimidine nucleotides?

14. (a) What is the role and significance of glutamate dehydrogenase?

Or

(b) Write short notes on essential and non-essential amino acids.

15. (a) Write a note on the significance of heme.

Or

(b) What are mucopolysaccharidoses explain in brief?

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Write a detailed glycolysis with its inhibitors and regulation.

17. Write a brief note on ketogenesis and its regulation.

18. What are the inhibitors of nucleotide biosynthesis explain its various types?

19. Write a note on the degradation of glucogenic and ketogenic amino acids.

20. Write a detailed note on the classification, pathology and differential diagnosis of jaundice.

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**S–6722**

**Sub. Code**
**23MBC2C3**

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

**CLINICAL BIOCHEMISTRY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. What is sickle cell anemia?
2. Enlist the biological specimens.
3. Write on gestational diabetes and microalbuminuria.
4. Give information on lipid profile.
5. What are cystic fibrosis and NBS?
6. Write a note on AST and ALT.
7. Write about cirrhosis and fatty liver.
8. What are acute phase proteins?
9. Explain on thyroid hormones.
10. What do you know about nephrolithiasis?

## Part B (5 × 5 = 25)

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

11. (a) Describe collection and preservation of blood samples.

Or

(b) Discuss about the blood clotting disorders.

12. (a) Summarize on atherosclerosis.

Or

(b) Give an account on glucometers.

13. (a) Write about amniocentesis and therapeutic enzymes.

Or

(b) Elucidate on dystrophy and diagnostic markers.

14. (a) Illustrate elaborately on hypertension and coma.

Or

(b) Give an account on serum protein electrophoresis.

15. (a) Explain in detail on adrenal disorders.

Or

(b) Discuss about the dialysis.

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Elaborate on the blood cell disorders.

17. Explain in detail all about diabetes.

18. Discuss about the clinical importance of enzymes.

19. Write in detail about LFT.

20. Describe in detail on renal function tests.

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**S–6723**

| Sub. Code |
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| 23MBC2E1 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

**Elective – ENERGY AND DRUG METABOLISM**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** the questions.

1. What is the role of energy-rich compounds in metabolism?
2. How do you calculate free energy?
3. Define Q-cycle.
4. Define protonophores.
5. What is the function of the peroxidase enzyme?
6. What are the steps involved in light reaction?
7. Why TCA cycle is called as “hub of metabolism”?
8. What are the products of TCA cycle?
9. What is the biological role of SAM?
10. Where is the site of glucuronidation?

## Part B

$(5 \times 5 = 25)$

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

11. (a) Differentiate enthalpy from entropy in bioenergetics.

Or

(b) What is the role of hydroperoxidases and oxygenases? Give examples.

12. (a) What are the complexes proteins involved in electron transport chain?

Or

(b) How ATP is converted to ADP in mitochondria?

13. (a) Differentiate cyclic and non-cyclic photophosphorylation.

Or

(b) Describe the mechanism of Hatch and Slack pathway.

14. (a) What is the purpose of beta-oxidation? How it is inhibited?

Or

(b) Describe the importance of malate-aspartate shuttle system for gluconeogenesis.

15. (a) What are the factors affecting the activities of xenobiotid enzymes?

Or

(b) Describe the hydroxylation process of xenobiotics.

## Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the basic principles of bioenergetics equilibria and concept of free energy.

17. Elucidate the steps of citric acid cycle and its regulation.

18. Elaborate oxidative phosphorylation and how it is inhibited.

19. Explain the biosynthesis and regulation of Krebs cycle.

20. Explain the glutathione conjugation and acetylation reactions.

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**S–6724**

**Sub. Code**
**23MBC2E2**

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

***Elective* – NUTRITIONAL BIOCHEMISTRY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. Define balanced diet and nutrition.

2. Write on calorific value of foods.

3. Elaborate on elements of nutrition.

4. Give information on protein sparing action of carbohydrates and fats.

5. Define the term vitamins with suitable examples.

6. Write a note on dietary sources of minerals.

7. Define malnutrition.

8. Mention the diseases caused by protein.

9. What is starvation?

10. Explain jaundice and ulcer.

## Part B

$(5 \times 5 = 25)$

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

11. (a) Describe on SDA and physical activity.

Or

(b) Discuss about the food groups and its significance.

12. (a) Summarize on role of dietary fibre and essential amino acids.

Or

(b) Give an account on food toxins and preservatives in health.

13. (a) Write about classification of minerals and vitamins.

Or

(b) Elucidate on the role of B complex as coenzymes.

14. (a) Illustrate elaborately on deficiency diseases of B vitamins.

Or

(b) Give an account on PEM.

15. (a) Explain in detail on ulcer and jaundice.

Or

(b) Discuss about the atherosclerosis and hypertension.

## Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elaborate on the nutrition during infancy and childhood.

17. Explain in detail on effect of alcohol and tobacco in health.

18. Discuss about the deficiencies of vitamins A, C, D, E and K.

19. Describe on functions of Ca, K, Mg, Fe, I, Zn and Cu.

20. Write in detail about obesity.

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| S–6725 |
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| Sub. Code |
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| 23MBC2S1 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Second Semester**

**Biochemistry**

**FUNDAMENTAL OF MEDICAL LABORATORY TECHNOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. Show the danger signs of reagents.
2. Define corrosives give examples.
3. What is a lab register?
4. What do you mean by anaerobic jar?
5. Blood smear.
6. Define Magnification.
7. What is a Resolution?
8. State the function of an Autoclave.
9. What is a Molar solution?
10. Recall the usage of Incineration.

## Part B (5 × 5 = 25)

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

11. (a) Describe Clinic borne infection and personnel hygiene in clinical lab.

Or

(b) List out the code and conduct of a medical laboratory personnel.

12. (a) Use of Water bath.

Or

(b) Use and care of a Hot air oven.

13. (a) Describe Anticoagulants and preservation of blood sample.

Or

(b) Write about the chemical composition, structure, and properties of laboratory substances.

14. (a) Differentiate between accuracy and precision in a medical laboratory.

Or

(b) Outline the responsibilities of a technician in the maintenance of the analyser.

15. (a) Describe the essential elements of TQM. What do you mean by total quality management (TQM)?

Or

(b) Explain the causatives of lab accidents. Write about prevention, safety and first aid in accidents caused by acids.

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Construct a detailed write up on the principle of centrifugation. Mention the types and applications of different kinds of centrifugation techniques.

17. Give a brief account on the principle, limitations and uses of Electron microscopy

18. Generalize the basic steps involved in blood collection and maintenance.

19. Explain the types of analyzers used in clinical laboratory.

20. Elaborate on pH and buffers.

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| S–6729 | Sub. Code |
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| | 23MBC3C4 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Third Semester**

**Biochemistry**

**BIOSTATISTICS AND DATA SCIENCE**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** the questions.

1. Define – Secondary data.

2. Explain frequency distribution.

3. What is coefficient of range?

4. State the kurtosis.

5. Define the term of simple correlation.

6. What are the types of statistics?

7. Explain the square root transformation.

8. How far is the main purpose of descriptive statistics?

9. What do you mean by cross validation in model evaluation?

10. Write difference between supervised and unsupervised learning.

## Part B (5 × 5 = 25)

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

11. (a) Explain the different kinds of data.

Or

(b) Draw pie chart for the following data.

| Causes of death | Numbers |
|---|---|
| Diarrhea and Enteritis | 60 |
| Prematurity and atrophy | 170 |
| Bronchitis and Pneumonia | 90 |

12. (a) Distinguish between the mean, median and mode.

Or

(b) Calculate mean, median and mode from the following data

| Weight of fishes : | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
|---|---|---|---|---|---|---|---|---|
| No. of fishes : | 11 | 8 | 15 | 6 | 2 | 5 | 9 | 19 |

13. (a) Write explanatory note on deliberate and stratified sampling.

Or

(b) Define a random sample. Discuss the importance of random sample in statistical inference.

14. (a) Distinguish the correlation coefficient.

Or

(b) Comment on the use of MS Excel in ANOVA.

15. (a) Explain the architecture of a typical Recurrent Neural Network (RNN) used for language modeling, including the input hidden and output layers.

Or

(b) Compare and contrast the advantages and disadvantages of using SARSA versus Q-learning.

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

Answer any **three** questions.

16. Highlight the advantages and disadvantages of primary data over the secondary data.

17. List out the detailed methods of skewness.

18. A randomized controlled trial was conducted to evaluate the effectiveness of a new vaccine against a particular disease. Out of 500 peoples who received the vaccine, 20 developed the disease, while out of 500 peoples who received a placebo, 40 developed the disease. Calculate the relative risk and 95% confidence interval for the association between vaccination and disease development.

19. The following data relate to the number of children classified according to the type of feed and the nature of teeth. Use chi-square test and draw complete inference from this data.

| Type of feed | Nature of teeth | |
|---|---|---|
| | Normal | Defective |
| Breast | 4 | 9 |
| Bottle | 3 | 15 |

20. Give a detailed account on applications of Artificial Intelligence (AI) in medical and pharma industries.

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| S–6731 | Sub. Code |
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| | 23MBC4C1 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025.**

**Fourth Semester**

**Biochemistry**

**PHARMACEUTICAL BIOCHEMISTRY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. What is the role of *in vitro* studies in drug development?
2. List out the key objectives of pre-clinical studies in drug development.
3. Define rule of three and five in pharmacology.
4. Mention significance of pharmacophore in drug designing.
5. Illustrate the difference between partial agonist and antagonist.
6. How do drug-protein interactions impact pharmacological outcomes?
7. Define drug efficacy and mention its importance.
8. List out the drugs used to treat fungal infections.
9. What are the primary goals of phase I clinical trials in drug development?
10. Outline the main features of phase IV clinical trials.

## Part B (5 × 5 = 25)

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

11. (a) Discuss the correlations between various animal models and human situations in biomedical research.

Or

(b) Explain the process of identifying and preparing a chemical compound library.

12. (a) Discuss about ligand and protein preparation.

Or

(b) How does molecular dynamics (MD) simulation favours drug development?

13. (a) What are the factors affecting drug metabolism?

Or

(b) Describe the methodology of receptor binding assays.

14. (a) Outline the principles involved in the chemotherapy of parasitic infections.

Or

(b) Enumerate the pharmacodynamics of antimalarial agents.

15. (a) Summarize the phase III clinical trials.

Or

(b) Discuss the methodology involved in the assessment of clinical trials.

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Elaborate on the process and significance of

    (a) Drug target identification and (5)

    (b) Hit identification in drug discovery. (5)

17. Explain the techniques involved in developing a pharmocophore map.

18. Discuss the classification of receptors based on their mechanism of action.

19. Detail on mode of action of chloramphenicol.

20. Discuss the methodological and organizational considerations involved in conducting clinical trials.

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| S–6732 |
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| Sub. Code |
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| 23MBC4C2 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Fourth Semester**

**Biochemistry**

**BIOCHEMICAL TOXICOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. How toxicant are classified?
2. Define linear dose response.
3. Write the impact of absorption on toxic response.
4. Comment on toxication vs detoxification.
5. Mutagenesis assay.
6. What is tissue specific toxicity?
7. What is direct toxic action?
8. Genetic toxicity.
9. What are the biochemical markers of neuro damage?
10. What is teratogenesis?

## Part B (5 × 5 = 25)

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

11. (a) What are the measurements of frequency of exposure and effect?

Or

(b) Short notes on measurements of dose- response mechanism.

12. (a) Give detail account on role of cytochrome P-450 on xenobiotic metabolism.

Or

(b) How the toxic responses are affected by absorption and distribution?

13. (a) Describe the mechanism of toxicity on excitable membrane function.

Or

(b) Give an account on covalent binding to cellular macromolecules.

14. (a) Write the mechanism of responses of direct dose toxicity.

Or

(b) Explain the physiological effects of toxicity.

15. (a) Explain the toxic response of Liver.

Or

(b) Describe about multi-organ toxicity.

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Mention the biomarker criteria of toxicity and describe measures to prevent occupational hazards.

17. Give the examples of activation of xenobiotics that leads to cellular injury.

18. Narrate biochemical basis of toxicity. Describe the mechanism of tissue specific toxicity.

19. Explain in detail about the principles, mechanism and pathogenesis of developmental toxicity.

20. What is neurotoxicity? What are neurotoxic agents? Describe mechanism of action of neurotoxicity with two examples.

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**S–6733**

**Sub. Code**
**23MBC4E1**

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Fourth Semester**

**Biochemistry**

**Elective – BIOSAFETY, LAB SAFETY AND IPR**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. What is the function of primary containment?
2. Define 'risk management' in the context of biosafety.
3. List the common types of PPE used in laboratories.
4. What are the safe practices to handle sharps in a laboratory?
5. What are 'geographical indications'?
6. What is TRIPS?
7. What is the significance of patent publication in the Gazette of India.
8. List two key forms required for an international patent application under the PCT.
9. Give two ethical issues associated with the Human Genome Project.
10. Define 'human cloning'.

## Part B

$(5 \times 5 = 25)$

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

11. (a) Illustrate the differences between Biosafety Levels (BSL) 1 and 2 and provide examples of organisms handled at each level.

Or

(b) Describe the process of obtaining approval for GMO research from the IBSC.

12. (a) Demonstrate the steps involved in responding to a chemical spill in a laboratory.

Or

(b) Analyze the potential health impacts of exposure to antibiotic-resistant bacteria in the laboratory.

13. (a) Describe the significance of the Budapest Treaty in the patenting process.

Or

(b) Demonstrate how to search for a patent in an international database and summarize the key findings.

14. (a) Explain the difference between a provisional and a complete patent specification.

Or

(b) Discuss patent infringement with an example.

15. (a) Explain the concept of 'informed consent'.

Or

(b) Illustrate the ethical considerations involved in the environmental release of GMOs.

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

Answer any **three** questions.

16. Compare and contrast the roles of the RCGM and the GEAC in GMO regulation.

17. Illustrate a detailed protocol for the safe handling and disposal of biohazardous material in a laboratory.

18. Compare the patentability and procedures for patenting microorganisms versus higher organisms.

19. Analyze the key differences between the patent filing process in India, Europe, and the US.

20. Assess the ethical concerns related to stem cell research and the impact of bioethical guidelines on the conduct of stem cell research.

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| S–6734 |
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| Sub. Code |
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| 23MBC4S1 |

**M.Sc. DEGREE EXAMINATION, APRIL 2025**

**Fourth Semester**

**Biochemistry**

**DEVELOPMENTAL BIOLOGY**

**(CBCS – 2023 onwards)**

Time : 3 Hours Maximum : 75 Marks

**Part A** (10 × 2 = 20)

Answer **all** questions.

1. What are Morphogens?
2. State Totipotency.
3. Recall superficial cleavage.
4. Define epiboly.
5. What are Feeder cells?
6. Define Tissue engineering.
7. What is Neoteny?
8. Define dedifferentiation.
9. Define Apoptosis.
10. What is a Senescent cell?

## Part B (5 × 5 = 25)

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

11. (a) Outline the cell lineages with suitable diagrams.

Or

(b) Prepare brief notes on the history and scope of cellular differentiation.

12. (a) Describe key features of *Drosophila melanogaster* which allow it to be a model organism.

Or

(b) Discuss the morphogenetic movement patterns involved in gastrulation.

13. (a) Choose the stage of development best suited for tissue engineering.

Or

(b) Discuss the recent developments in the use of tissue engineering in therapeutics.

14. (a) Criticize various morphological and physiological changes which take place during the metamorphosis in amphibians.

Or

(b) Conclude the mechanism, techniques and utility of organogenesis.

15. (a) Explain the role of frizzled receptors in development and disease.

Or

(b) Justify the role of senescent cells in ageing.

## Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Compose an essay on Genomic imprinting.

17. Generalize on the gametogenesis, role of hormones and sex determination mechanism.

18. Elaborate on the major ways of regeneration.

19. Construct an essay on tremendous changes taking place during metamorphosis.

20. Explain in detail the various theories of cellular aging.

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