

## M. Sc. (Medical Biochemistry)

Programme : M.Sc. (**Med- Biochemistry**)  
Duration : 3 Year full time (annual system)  
Medium : English

**Program outcome-** At the end of course, postgraduates should be able to

- Plan, execute and evaluate teaching assignments in Medical Biochemistry
- Plan, execute, analyze and present the research work in medical Biochemistry.
- To acquire various skills for collaborative research.
- To participate in various workshops/seminars/journal clubs/demonstration in the allied departments
- **Program specific outcome** At the end of the course in Master of Science in Biochemistry the student should be able to cater the following responsibilities:
  - Teaching Skills
  - Research Methodology
  - Laboratory and Diagnostic skills
  - Communication and attitudinal skills

## **Eligibility :**

- B. Sc Medical Biochemistry from any UGC approved university.
- MBBS/BDS recognized by M.C.I/D.C.I.
- Graduation in any medical/science/ life sciences field from any UGC approved University.

## **Objectives**

At the end of the course in Master of Science in Biochemistry the student should be able to.

- Acquire comprehensive knowledge of infectious agents, its identification by laboratory techniques.
- Ability to communicate the acquired knowledge clearly & with precision.
- Acquire knowledge of drugs used in treatment of such infections, preparation of museum specimens etc.
- Be familiar with the recent advances in the medical Biochemistry.

## **Learning activities & training:**

1. **Didactic teaching:-**
2. **Communication Skills:-** Journal club, Seminars.
3. **Hand on experience:-** Techniques in Biochemistry, museum specimens and experimental work
4. **Teaching assignments:-** Taking U.G classes, demonstrations & practical for one semester. Preparation of A .V aids for teaching, presentations, and setting objective questions - SAQs / MCQs. Participation in symposia, seminars & workshops.
5. **Research:-** Project / thesis - Project should be submitted 6 month before the final examination.
6. **Evaluation** Written and practical assessment every semester. Internal assessment tests in theory & practical shall be conducted every year of M.Sc. course. University Examination shall be held b the university at the end of each year which is as follows:-

**Study & Evaluation Scheme**  
**Programme : M.Sc. (Medical Biochemistry)**  
**1<sup>st</sup> Year PRELIMINARY EXAMINATIONS:-**

Course Code	Subject	Theory				Practical			Grand Total
		Theory Written	Internal Assessment	Viva	Total	Marks	Internal Assessment	Total	
1	Basics of Anatomy	100	20	20	140	40	20	60	200
2	Basics of Physiology	100	20	20	140	40	20	60	200
3	Basics of Biochemistry	100	20	20	140	40	20	60	200

**Grand Total-600**

(There shall be two papers ie Paper-A&Paper-B of 50 marks each.)

- ❖ Paper-A: Part I = 25 marks  
Part II = 25 marks
- ❖ Paper-B: - Part I = 25 marks  
Part II = 25 marks

**3<sup>rd</sup> Year FINAL EXAMINATIONS:-**

Theory							Practical		
Paper-I	Paper-II	Paper-III	Paper-IV	Internal Assessment	Viva	Total	Practical	Internal Assessment	Total
75	75	75	75	60	40	400	150	50	200

**Grand Total-600**

- ❖ Paper I –
- ❖ Paper II –
- ❖ Paper III –
- ❖ Paper IV –

**Panel of Examiners:**

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the Principal & approved by the university,-

**Result:**

Shall be prepared and declared as below: -

- 50% & above separately in theory & practical pass
- 75% & above separated in theory & practical pass with distinction.
- Below 50% in any theory or practical fail

**Eligibility for appearing in university examination:-**

1. 75% Attendance in theory and 80 % Attendance in Practical
2. The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination

**Reappear or Supplementary Exam:-**

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the supplementary Examination with in 3 months after the regular examination. Failure in supplementary examination will cause reversion to the corresponding junior batch to the whole syllabus

**Question Paper Structure:-**

The question paper shall consist of 6 questions carrying equal marks, all the questions are to be attempted. Questions can be short question / answer, long question, diagrams & enumerators giving coverage.

1. The question paper shall consist of EIGHT questions, out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question No. 1 shall contain 8 parts representing the entire syllabus and students shall have to answer any five (weightage 3 marks each).
2. Out of the rest SEVEN questions, students shall be required to attempt any five questions. The weight age of questions no. 2 to 8 shall be 12 marks each.

## M.Sc. (Medical Biochemistry) – 1<sup>st</sup> Year

### Basics of Anatomy

#### General Anatomy:

1. Anatomical terminology, Anatomical plane, Anatomical positions, Clinical positions, Terms related to movements.
2. Basics of cytology: Structure of cell wall, Cell organelles, **functional** complexes
3. Musculoskeletal system:
  - (a) Bones & classification, Morphology, ossification functions, blood supply
  - (b) Muscles, Morphology, classification blood supply, innervations, functions
4. Integumentary system: Thick skin, thin skin, layers of dermis epidermis, skin appendages, blood supply, innervations, functions.
5. Cardiovascular system: Morphology of blood vessel, classification of blood vessels, blood capillaries, blood circulation, functions.
6. Nervous system: Central Nervous System, Peripheral **Nervous** System, Gross Basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, **Autonomic** nervous system.
7. Endocrine system: Classification, Hormone produces, Control of hormone secretion, basic functions.
8. Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions.
9. Digestive system: Parts of digestive system, gross anatomy and functions.
10. Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, penis and their functions
11. Reproductive system: Male reproduction system- **gross** anatomy of testis, epididymis, vas deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle.
12. Basics of genetics: Cell division ,mitosis, meiosis, Cell cycle, Chromosomes.

#### Gross Anatomy (Elementary Anatomy):

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck & Fact Region

#### Books Recommended:

1. Williams et al. *Gray's Anatomy*. Churchill Livingstone.
2. Young, B. and 1. Heath. *Wheaters' Functional Histology*. Churchill Livingstone.
3. Ross, M.H. *Histology: A Text & Atlas*. Williams & Wilkins.
4. Langman, Jan. *Medical Embryology*. William and Wilkins.
5. Thompson, J.S. and M.W. Thompson. *Genetics in Medicine*. Philadelphia:W.B. Saunders.
6. Stuin, J and M.B. Carpenter. *Human Neuroanatomy*.
7. Snell, Richard S. *Clinical Neuroanatomy for Medical Students*. William and Wilkins.

**M.Sc. (Medical Biochemistry) - 1<sup>st</sup> Year**  
**Basics of Physiology**

**1. Cell Physiology:**

Cell structure and membrane transport, Resting Membrane Potential, Composition of ECF and RCF, Nernst Equation, Equilibrium Potential, Goldmann Equation.

**2. Nerve-Muscle and Biopotential:**

Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of **contraction** and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation).

**3. Blood:**

Function and Composition, Erythrocytes, Haemoglobin, Blood Groups, Leucocytes, Thrombocytes, Immunity

**4. Cardiovascular System:**

Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation.

**5. Respiration:**

Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants, Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity.

**6. Gastrointestinal Tract:**

Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function of bile), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT.

**7. Excretory System:**

Function of kidney, Structure of nephron, Juxta glomerular apparatus, Formation of urine. Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid- base balance, Renal function tests, Micturition.

**8. Autonomic Nervous System:**

Organization of the ANS, Chemo-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems.

**9. Central Nervous System:**

General organization of CNS & PNS, Sensory system (General sensations, receptors,

sensory pathways, sensory areas of brain).

Brain: Functions of Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep.

#### **10. Special Senses:**

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway).

#### **11. Endocrine System:**

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas.

#### **12. Reproductive System:**

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning.

#### **Books Recommended (Latest Edition):**

1. Guyton, A. *Textbook of Medical Physiology*. Elsevier.
2. Ganong, W.F. *Review of Medical Physiology*. Lange.
3. Khurana, I. *Textbook of Physiology*. Elsevier.
4. Berne, Y. *Principles of Physiology*. Elsevier Mosby.
5. Rhodes and Bell. *Medical Physiology: Clinical Medicine*. Williams &Wilkins,.

**M.Sc. (Medical Biochemistry) - 1<sup>st</sup> Year**  
**Basics of Biochemistry**

Basic concepts of Biochemistry to be studied under the following headings:

1. Cell structure and function and transport through the biological membrane.
2. Chemistry of Biomolecules - Carbohydrate, lipids, amino acids, proteins and nucleic acids.
3. Chemistry of Blood & haemoglobin.
4. Enzymes.
5. Bioenergetics and Biologic oxidation.
6. Metabolism of carbohydrates, proteins, lipids and nucleotides.
7. Integration of metabolism.
8. Nutrition, vitamins & minerals.
9. Molecular Biology.
10. Detoxification & Xenobiotics.
11. Oxygen derived free radicals.
12. Immunology.
13. Organ function tests.

**Books Recommended:**

1. Stryer, Lubert, ed. *Biochemistry*. New York: W.H. Freeman.
2. Lehninger, Nelson and Cox, ed. *Principles of Biochemistry*. New Delhi: CBS Publishers.
3. Murray, R.K. and P.A. Mayes, ed. *Harper's Biochemistry*.
4. Devlin, Thomas M., ed. *Textbook of Biochemistry with Clinical Correlations*. New York: Wiley-Liss.
5. Lewin, Benjamin, ed. *Genes VI*. Oxford: Oxford University Press.

**M.Sc. (Medical Biochemistry) – 1<sup>st</sup> Year**  
**Research methodology**

**Unit – 1**

Methods of collection of data, classification and graphical representation of data. Binomial and normal probability distribution. Polygon, histogram, measure of central tendency. Significance of statistical methods, probability, degree of freedom, measures of variation - Standard deviation, Standard error.

**Unit – 2**

Sampling, sample size and power. Statistical inference and hypothesis. Tests for statistical significance: t-test, Chi-square test, confidence level, Null hypothesis.

**Unit – 3**

Analysis of Variance (one way and two way ANOVA). Factorial designs (including fraction factorial design). Theory of probability, Permutation and Combination, Ratios, Percentage and Proportion and Multiple comparison procedures.

**Unit – 4**

Non-parametric tests, Experimental design in clinical trials, Statistical quality control, Validation, Optimization techniques and Screening design. Linear regression and Correlation, least square method, significance of coefficient of correlation, nonlinear regression.

**Unit – 5**

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report: Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons. Use of SPSS in Data Analysis.

**Books Recommended:**

1. Cooper & Schindler. *Business Research Methods*. New Delhi: Tata McGraw Hill.
2. Saunders' *Research Methods for Business Students*. Pearson Education, 2007.
3. Malhotra, Naresh K. *Marketing Research*. Pearson Education.
4. Fisher, R.A. *Statistical Methods for Research Works*. Edinburgh: Oliver & Boyd.
5. Chow. *Statistical Design and Analysis of Stability Studies*. New York: Marcel Dekker.
6. Finney, O.J. *Statistical Methods in Biological Assays*. New York: Hafner.
7. Montgomery, D.C. *Introduction to Statistical Quality Control*. New York : Willy.
8. Lipschutz. *Introduction to Probability and Statistics*. New York: McGraw-Hill.

**M.Sc. (Medical Biochemistry) - 1<sup>st</sup> Year**  
**BASICS OF ANATOMY (PRACTICALS)**

Practical : Demonstration of the following on dissected parts

1. Anatomical terminology (anatomical plane, anatomical positions, other positions required in clinical practice, terms related to movements and sections etc.)
2. Basics of cytology
3. Musculoskeletal system
4. Integumentary system
5. Cardiovascular system
6. Nervous system
7. Endocrine system
8. Lymphatic system
9. Digestive system
10. Excretory system
11. Reproductive system
12. Basics of Genetics (cell division, cell cycle)

**Gross Anatomy Dissections:**

1. Superior Extremities
2. Inferiors Extremities
3. Thorax
4. Abdomen
5. Pelvis
6. Head, Neck and Face

**M.Sc. (Medical Biochemistry) 1<sup>st</sup> Year**  
**BASICS OF ANATOMY (PRACTICALS)**

1. Study of microscope
2. Preparation and staining of blood film and identification of different blood cells
3. Differential leukocyte count
4. Determination of blood group
5. Estimation of haemoglobin
6. Haemin crystal
7. Determination of bleeding and clotting time
8. Total leukocyte count

**Books Recommended:**

1. Burtis and Ashwood, ed. *Textbook of Clinical Chemistry*. Philadelphia: W.B.Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

**M.Sc. (Medical Biochemistry) – 1<sup>st</sup> Year**  
**BASICS OF BIOCHEMISTRY (PRACTICALS)**

Basic awareness of laboratory with respect to equipments and glassware, units of measurement and calibration of volumetric apparatus, preparation and storage of reagents, standard solutions, buffer solutions and pH determination.

1. Introduction : Handling of chemicals, preparation of reagents, Pipetting etc.
3. Colour reactions of carbohydrates.
4. Colour reactions of Lipids .
5. Colour reactions of proteins.
6. Precipitation reactions of protein.
7. Individual proteins -Albumin, Globulin, Casein & Gelatin.
8. Unknown protein identification .
9. Milk Analysis.
10. Starch digestion by salivary amylase and products.
11. Normal constituents of urine.
12. Abnormal constituents of urine and reporting of abnormal urine.
13. pH determination and buffer preparation.
14. Demonstration: Spectroscopic examination of blood.
15. Verification of Beer's Lambert Law: Colorimetry, Spectrophotometry.
16. Estimation of serum glucose level and glucose tolerance test.
17. Estimation of total protein and albumin level and calculation of A/G Ratio.
18. Estimation of serum urea level and calculation of urea clearance.
19. Estimation of Serum Uric Acid level.
20. Estimation of Serum Creatinine level and Calculation of Creatinine clearance.
21. \* Liver Enzymes Diagnostic Enzymology :- \* Cardiac Enzymes \* Misc.
22. Estimation of Serum ALP Activity
23. Clinical problems involving organ function tests.
24. Demonstration: Electrophoresis. (Paper, agarose & PAGE)
25. Demonstration: Chromatography (Paper HPLC)
26. Demonstration: Flame photometry.
27. Special Technique:- Bioluminescence, fluorimetry, Chemiluminescence.

28. Quality Control.
29. Molecular Biology Practicals.

**Books Recommended:**

1. Burtis and Ashwood. *Tietz's Textbook of Clinical Chemistry*. Philadelphia: W.B. Saunders.
2. Keith, Wilson and John Walker, ed. *Principles and Techniques of Practical Biochemistry*. Cambridge: Cambridge University Press.

## **M.Sc. (Medical Biochemistry)**

### **TEACHING PRACTICE**

#### **Course Contents:**

1. Acquire competence to plan for instructions and delivery of curriculum.
2. Obtain feedback both about teaching as well as student learning.
3. To develop broad understanding of modern principles and procedures used in medical science education.
4. Development of essential skills for practicing modern medical science teaching.

For teaching practice, the student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising one internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners by the recommended by the Director/Dean of the College/Faculty. All the three examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned.

## **M.Sc. (Medical Biochemistry)**

### **THESIS**

#### **Guidelines:**

1. Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post- M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./Ph.D. degree in the subject or related subjects shall be qualified for being taken as Co-guide.
2. The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the University within two months of commencement of second year. The University will convey approval/disapproval of the Plan within one month.
3. In case, the Plan is disapproved, a fresh plan must be submitted within one month. After approval of the plan, the student will begin work on the thesis.
4. The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the University through the Guide, six months before the date of 3<sup>rd</sup> Year University examination.
5. It will be evaluated by a panel of two examiners (01 external & 01 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of 3<sup>rd</sup> year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has/ have suggested for the revision.
6. After approval of revised thesis, the candidate can appear in the ext 3<sup>rd</sup> Year Examination, provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3<sup>rd</sup> Year examination, provided there is a one month gap between the receipt of approval and commencement of examination.

**Note:** A student is required to submit four hard copies of the thesis alongwith the soft copy in the prescribed format given by the University.