REGULATIONS AND CURRICULUM GOVERNING

M.Sc. MEDICAL BIOCHEMISTRY PROGRAM

(2024-25)

Name of the Constituent Unit/Centre: Yenepoya Medical College



YENEPOYA

Deemed to be University

Deralakatte, Mangalore, Karnataka.

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NOTIFICATION FROM THE UNIVERSITY

YENEPOYA UNIVERSITY

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Ref: No. YU/REG/ACA/3-ACM/2009 31.10.2009

NOTIFICATION

Sub: Starting of M.Sc. in pre & para clinical departments

Ref: Resolution of the Academic Council at its 3rd meeting held on 31.10.2009 vide agenda - 3

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The Academic Council at its 3rd meeting and subsequently the Board of Management at its 9th meeting held on 31.10.2009 have resolved to approve the proposal to start following M.Sc. in pre & para clinical departments:-

1. M.Sc Medical Anatomy
2. M.Sc Medical Physiology
3. M.Sc Medical Biochemistry
4. M.Sc Medical Pharmacology
5. M.Sc Medical Microbiology

This notification is issued for implementation with effect from the academic year 2010-2011.

I/c REGISTRAR
Registrar
YENEPOYA
(Deemed to be University)

To:

The Principal - YMC

Copy to:

1. Controller of Examinations
2. File copy

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Preamble

Medical Biochemistry is a dynamic and integrative discipline that bridges basic biochemical principles with clinical sciences. It provides a molecular understanding of human physiology and disease, forming the foundation for modern diagnostics, therapeutics, and biomedical research. With rapid advancements in molecular biology, genomics, proteomics, metabolomics, and translational medicine, the scope of Medical Biochemistry has expanded significantly, necessitating advanced academic training and research competence.

The Master of Science (M.Sc.) in Medical Biochemistry program is designed to provide in-depth theoretical knowledge, advanced laboratory skills, and research expertise in areas such as enzymology, metabolism, molecular diagnostics, clinical biochemistry, immunochemistry, endocrinology, and biomedical instrumentation. The curriculum integrates fundamental biochemical concepts with their clinical applications, enabling students to understand disease mechanisms at the molecular level and contribute effectively to healthcare and biomedical research.

This program emphasizes analytical thinking, experimental design, data interpretation, quality control in clinical laboratories, and ethical research practices. It also aims to cultivate skills in scientific communication, interdisciplinary collaboration, and evidence-based practice. Through coursework, practical training, seminars, and dissertation research, students are prepared for careers in clinical laboratories, pharmaceutical and biotechnology industries, academic institutions, research organizations, and public health sectors.

Goal

The goal of the M.Sc. Medical Biochemistry programme is to develop highly competent professionals with advanced knowledge, practical skills, and research aptitude in medical and clinical biochemistry. The programme aims to provide a comprehensive understanding of the molecular basis of health and disease and to train students in modern biochemical, molecular, and diagnostic techniques.

It seeks to prepare graduates who can:

- Apply biochemical principles to clinical diagnosis and disease management.

- Perform and interpret advanced laboratory investigations with accuracy and quality assurance.
- Conduct independent research and contribute to advancements in biomedical sciences.
- Utilize modern analytical tools and molecular technologies in clinical and research settings.
- Uphold professional ethics, laboratory safety, and regulatory standards.

At the end of his/her training, the student shall be able to take up a career in **Teaching Institution,** Diagnostic Laboratory or Research.

Learning Objectives

A) KNOWLEDGE

At the end of the course, the student will be able to:

1. Describe the cell organelles with their molecular and functional organisation.
2. Delineate structure, function and interrelationship of various biomolecules and consequences of deviation from the normal.
3. Understand basic enzymology and emphasise on its clinical applications' wherein regulation of enzymatic activity is disturbed.
4. Describe digestion and assimilation of nutrients and consequences of malnutrition.
5. Describe and integrate metabolic pathways of various biomolecules with their regulatory mechanisms.
6. Explain the biochemical basis of inherited disorders with their associated squeal.
7. Describe mechanisms involved in maintenance in water, electrolyte and acid base balance and consequences of their imbalances.
8. Outline the molecular mechanism of gene expression and regulation, basis principles of biotechnology and their applications in medicine.
9. Understand with basic immunology involving molecular concepts of body defence mechanisms and their applications in medicine.
10. Explain the principles of various laboratory estimations, instrumentations and rationale underlying biochemical laboratory investigations.
11. Understand the fundamentals of Bio statics

B) Skills

1. Conduct Biochemical laboratory investigations and experimentations relevant to clinical management and biomedical research. Analyze, interpret and evaluate the data. Rationalize their application in clinical management and experimental research.
2. Plan & conduct lecture, practical demonstrations, tutorial classes and small group discussions on clinical problems for undergraduates students of medical and allied disciplines.
3. Be familiar with literature survey, computer skills.
4. Critically review & comment on research papers and give oral presentation.
5. Prepare research protocols, conduct experimental studies analyze and solve clinical and experimental problems.

Subject Specific Competencies

The student during the training programme should acquire the following competencies:

1. Describe and apply biochemical principles to explain the normal state, abnormal disease conditions and mechanism of action used in the perception, diagnosis and treatment of diseases.
2. Explain energy transactions in a living system, and describe importance of biomolecules in sustaining the life process.
3. Describe pathways of the intermediary metabolism along with their individual and integrated regulation and apply that in understanding the functioning of the body.
4. Describe and apply the concept of nutrition in health and disease, micro-and macro-nutrition and essential nutrients, and interlinks of nutrients with metabolism and functions of a lining system.
5. Apply and integrate knowledge of molecular and metabolic conditions in normal and disease states for clinical problem solving and research
6. Acquire knowledge on application of various aspects of genetic engineering in medicine

7. Acquire knowledge and apply the principle of statistics, biostatistics and epidemiology to the evaluation and interpretation of molecular and metabolic disease states.
8. Evaluate, analyze and monitor disease states by applying relevant biochemical investigations and interpreting the clinical and laboratory data.
9. Able to integrate principles of immunology in biochemistry.
10. Demonstrate knowledge of basics of research methodology, develop a research protocol, analyze data using currently available statistical software, interpret results and disseminate these results and to have the potential ability to pursue further specializations and eventually be competent to guide students.
11. Take interactive classroom lectures, Seminars, Journal club and research presentations
12. Demonstrate knowledge of principles of Instrumentations.
13. Demonstrate knowledge about recent advances and trends in research in the field of clinical biochemistry.
14. Perform important biochemical, immunological and molecular biology techniques.
15. Observed working of important advanced techniques.
16. Demonstrate standard operating procedures of various methods and techniques used in clinical biochemistry.
17. Determination of enzyme activity and study of enzyme kinetics, ideally it should be accompanied by purification (partial) of the enzyme from a crude homogenate to emphasise the concepts of specific activity, yield and fold purification
18. Demonstrate presentation skills at academic meetings and publications.

Syllabus/ Course Content

Preliminary MSc

Theory

1. Chemistry of Biomolecules
2. Enzymes
3. Cell Structure
4. Digestion and Absorption
5. Metabolism

   Carbohydrate Metabolism

Lipid Metabolism

Amino Acid Metabolism

Biological Oxidation, Oxidative Phosphorylation

Heme Metabolism

Purine and Pyrimidine Metabolism

Acid Base Balance and Disorders

Detoxification

Vitamins

Minerals

Genetics

DNA Replication, Transcription, Translation, Mutation, Regulation of Gene Expression, Recombinant DNA Technology

6. Hemoglobin
7. Plasma Proteins
8. Liver Function Test, Kidney Function Test
9. Nutrition
10. Biochemical Techniques

II and III Year Theory Topics

Paper I - Chemistry and Techniques

Methods of qualitative analysis of biomolecules: Principles, experimental procedure and applications of: Chromatography, paper, thin layer, ion exchange, affinity, gel filtration, gas-liquid, HPLC. Principles, procedures and application of: Electrophoresis, paper, polyacrylamide gel, agarose gel, and cellulose acetate. Ultracentrifugation, ultrafiltration.

Quantitative methods: Principles and applications of: Photometry, Spectrophotometry, fluorometry, ion selective procedures, flame photometry.

Isotopes: Detection and measurement of radioactive isotopes. Application of isotopes in research and clinical biochemistry.

Concept of pH and buffers. Henderson - Hasselbalch equation. Principles and procedures of determination of pH.

Chemistry of amino acids and proteins: Structure and properties of amino acids. Protein structure and conformation. Methods to determine the amino acid sequence of proteins.

Chemistry of conjugated proteins, nucleoproteins, lipoproteins, immunoglobulins, glycoproteins. Structure- function relationship of proteins: hemoglobin, myoglobin and collagen. Protein - protein interactions.

Chemistry of carbohydrates: Monosaccharides, disaccharides, hompolysaccharides and heteropolysaccharides.

Chemistry of lipids: Classification, fatty acids, PUFA, compound lipids, cholesterol.

Nucleic acids : Chemistry and structure of bases, nucleosides, nucleotides, RNA and DNA. DNA sequence determination. Properties of nucleic acids. Recombinant DNA technique, cloning procedures, vectors, plasmids, phages, cosmids, and restriction map and PCR technique. Southern, Northern, Western blotting procedures. Restriction fragment polymorphism. In-situ hybridization. Genomic library and cDNA library mutations, mutagens, carcinogens, in vitro mutagenesis. Transgeneic animals and microinjection technique. Gene therapy.

Basic concepts of immunology: Chemistry of immunoglobulins, primary and secondary immune responses, auto immune phenomenon, anaphylaxis, Clonal selection, B cells, T cells, helper T cells, NK cells, macrophages, interleukins, cytokines, HLA antigens, monoclonal antibodies, Hybridoma technology, immunodiffusion, immuno- electrophoresis, radio immune assay (RIA), enzyme linked immunosorbent assay (ELISA), fluorescent in situ hybridization (FISH) techniques. (NK cells – Natural Killer Cells).

Bioenergetics and biological oxidation: Concept of free energy change, high energy compounds, ATP generation, redox potential, electron transport chain, oxidative phosphorylation, inhibitors, uncouplers, ionophores.

Cell fractionation, biochemical activities of different fractions, marker enzymes.

Enzymes: Classification, nomenclature, enzyme specificity, kinetics of enzyme activity, coenzymes and cofactors, regulation of enzyme activity, isoenzymes, pro-enzymes, multienzyme complexes, tandem enzymes, covalent modification, active site of enzymes, methods of locating the amino acid residues in the active sites, mechanism of enzyme action. Enzyme inhibitions: competitive, non-competitive, Allosteric, suicide.

Purification of enzymes from cells, characterization and criteria of purity. Purification of proteins.

Paper II (Intermediary Metabolism)

Methods of investigation of metabolic pathways. Primary secondary and tertiary metabolisms.

Carbohydrate metabolism: Details of metabolic pathways involving carbohydrates in mammals. Embden-Meyerhof pathway, hexose monophosphate shunt pathway, other minor pathways, fructose and Galactose metabolisms. Digestion and absorption. Blood glucose homeostasis, hormones influencing carbohydrate utilisation, insulin, glucagon, glucocorticoids, epinephrine and glucose tolerance test, Diabetes mellitus.

Amino acid metabolisms : Protein digestion an absorption of amino acids, metabolism of individual amino acids, one carbon units, polyamines, nitric oxide, plasma proteins, transport proteins.

Lipid metabolism: Digestion and absorption, transport and storage, fatty acid synthesis, fatty acid oxidation pathways. Biosynthesis of phospholipids, glycolipids. Cholesterol metabolism. Plasma lipoprotein metabolism. Role of adipose tissue and liver in lipid metabolism. Hormonal regulation of lipid metabolism. Prostaglandins, prostacyclins, leukotriens thromboxanes, and very long chain fatty acids.

Regulation of metabolisms: TCA cycle, integration of metabolisms, common terminal pathway, regulation, amphibolic role. Hormonal regulations of metabolic pathways, Cori's cycle, Alanine cycle, adaptation during starvation.

Purine and pyrimidine metabolisms: synthesis and degradation of bases and nucleotides, regulation, gout, Lesch-Nyhan syndrome.

DNA: Replication, DNA damage and repair processes, mutations, amplification of genes, somatic recombination, Telomeres, inhibitors of replication.

Transcription: Details of transcription, transcriptional control of gene expression, Operon concept, promoters, enhancers, silencers, hormone responsive elements, transcription factors, post-transcriptional modifications of RNA, exons, introns, splicing, Ribozymes, inhibitors of transcription.

Translation: Genetic code, tRNA, ribosomes, protein biosynthesis, post-translational modifications, inhibitors of translation, signal sequences, chaperones and heat shock proteins, anticancer drugs.

Protein degradation: Cathepsins, Proteosomes, Caspases. Muscle contraction.

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Paper – III

Clinical Biochemistry and Nutrition

Vitamins: Fat soluble and water soluble vitamins, chemistry, absorption, metabolism, biochemical roles, requirement, deficiency manifestations.

Mineral metabolism: Macrominerals, sodium, potassium, chloride, magnesium, calcium, phosphorus. Trace elements: iron, copper, manganese, zinc, cobalt, molybdenum, selenium, iodine and fluoride.

Nutritional requirements: Energy requirements, balanced diet, nutritional disorders, obesity, starvation, PUFA, dietary fibres, cholesterol.

Protein requirements: Nitrogen balance, nutritive value, biological value, chemical score, protein energy malnutrition, Kwashiorkor and Marasmus.

Membranes: Chemical composition, structure, biological properties, functions, membrane transport systems, ion channels, endocytosis, exocytosis, defects.

Endodrinology: Mechanism of action of hormones, hormone receptors, signal transduction, G-proteins, second messengers, cyclic AMP, cyclic GMP, calcium, Inositol triphosphate, diacyl glycerol, nitric oxide, Biosynthesis of adrenal and thyroid hormones, metabolic regulation by hormones, hormonal regulation of gene expression, hormonal disorders, biochemical investigation of endocrine disorders, thyroid and adrenal function tests.

Erythrocytes: chemical make up, metabolic pathways, haemoglobin, hemoglobinopathies, porphyrias, heme synthesis and degradation, bilirubin metabolism, jaundices, laboratory findings in jaundices.

Composition of blood plasma in health and diseases, normal values.

Acid base balance and electrolyte balance, related disorders.

Biochemical investigations of liver, kidney and gastric functions, malabsorption disorders, inherited metabolic disorders.

Cell biology: cell cycle, check points, regulation, Oncogenes, tumour suppressor genes, Apoptosis, tumour markers.

Reactive oxygen species and defence mechanisms, antioxidants and enzyme systems.

Diagnostic enzymology: LDH, CPK, AST, ALT, ALP, ACP, GGT, Amylase, 5’nucleotidase, etc.

Acute phase proteins: Alpha-1 anti-trypsin, Alpha-2 macrooglobulin, Haptoglobulin, Ceruloplasmin etc.

Alzheimer's disease, Prions, beta amyloid.

AIDS: HIV, genes and gene products, diagnosis, precautions.

Laboratory management: Precision, accuracy, specificity, sensitivity, percentage error, quality control, precautions in handling hazardous materials.

Practical Syllabus (and Work Schedule)

General Experiments

1) Acids Bases and Buffers : Factors determining Buffer capacity (3 days)

2) Colorimetry : Beer's Law (1 day)

3) Spectrophometry (1 day)

4) Molar extinction coefficient (1 day)

5) pK of glycine using pH meter (3 days)

6) General reactions of carbohydrates (2 days)

7) Estimation of Antioxidant activity

Ferric reducing ability of plasma (FRAP) method

DPPH (2,2-diphenyl-1-picryl-hydrazyl-hydrate) method (4 days)

8. Chromatography of carbohydrates :

a) Paper (2days)

b) Thin layer (2days)

9. Isolation of starch from potato / Reactions of starch (2 days)

10. Acid hydrolysis of starch (1 day)

11. Isolation of liver glycogen / Reactions of glycogen (2 days)

12. Color reactions of amino acids (3 days)

13. Estimation of amino acids by Ninhydrin method (1 day)

14. Chromatography of amino acids : a) Paper (2days)

b)Thinlayer (3days)

c) ion exchange (3 days)

15. TLC of lipids in plasma (3 days)

16. Isolation and estimation of DNA from tissues/blood: effect of temperature on DNA (3 days)

17. Spectrofluorometric analysis – screening for serum fluorescent advanced glycation end products (AGEs). (2 days)

Experiments for Demonstration

Molecular biology experiments

18. Polymerase Chain Reaction- PCR (conventional and real time) (3days)
19. Blotting techniques –Western and Southern (4 days)
20. microRNA (miRNA) (1 day)
21. Complementary DNA (cDNA) (2 days)

Mass spectrometry-based Proteomics and Metabolomics:

22. LCMS/ MS (3 days)
23. High pressure liquid chromatography (2 days)
24. Fourier-transform infrared spectroscopy (FTIR) (2days)

Clinical Investigations

25. Blood sugar : Folin- Wu method (2 days)
Glucose oxidase method (1 day)
26. Blood Urea - Diacetyl monoxime method (2 days)
a. Enzymatic method (2 days)
27. Plasma uric acid (2 days)
28. Plasma creatinine (2 days)
29. Serum proteins
30.Lowry's method (including preparation of Folin's reagent (3 days)
31.Biuret (Total and A/G) (2 days)
32.Electrophoresis a) Agar Gel (2 days)
b) Polyacrylamide (2 days)
Gel filtration (3 days)
33. Hb by Cyanomethemoglobin method (1 day)
34.C.S.F. Analysis : Proteins (1 day)
Sugar (1 day)
35.Plasma Chlorides (1 day)
36.Plasma bicarbonate (2 days)
37.Plasma calcium (2 days)
38.Plasma inorganic phosphate (2 days)
39.Bilirubin : Total & Direct (2 days)
40.ALT (3 days)

41. AST

42. Acid phosphatase

43. Alkaline phosphatase (3 days)

44. Serum amylase (2 days)

45. GGT (2 days)

46.LDH a) Spectrophometric method (2 days)

47. Lipid Profile : Cholesterol -Free & Ester (4 days)

Triglyceride (2 days)

LDL and HDL (2 days)

48.Plasma Vitamin C (3 days)

49. Screening tests for Inborn errors of metabolism (IEM) 10 days

50. Toxicology screening tests 10 days

(Kit methods)

51. ELISA (TSH) 2 days

Cell Fractions and Enzymes

52. Sub cellular fractionation (1 week)

53. Factors effecting enzyme activity (15 days)

a) Enzyme concentration

b) Substrate concentration

c) pH

d) Temperature

54. Cytotoxicity and survival assays invitro 3 days

Training in Clinical Biochemistry Lab (15 days)

Routine and specialized assays in clinical biochemistry lab, sample collection methods, quality control methods, statistical analysis of data and setting up of clinical biochemistry laboratory. Days- 30 each in 2nd and 3rd years

Postings in Microbiology and Hematology lab sections

Additional posting in microbiology section of central lab' to observe routine culture methods and serological testing for common blood borne diseases. (7 days)

Additional posting in blood bank and hematology sections of central lab to observe routine methods and testing. (7 days)

Electives

Any two electives can be selected by student from the list of nine electives; one elective in each year of final MSc course (i.e. in 2nd and 3rd years)7 days for each elective

Objectives: They are given for each elective as follows-

Sl. no.	Elective subject	Learning objectives	Learning outcomes	Faculty mentors	Assessment methods
1	Basics of animal ethics and handling	1. To explain the basics of animal ethics and CPCSEA guidelines. 2. To list the basic handling procedures for rodents.	To use the guidelines and employ proper procedures while working with experimental animals.	Dr. Megha Rani, Dept. of Pharmacology	Concept mapping, Short questions
2	Diabetic care	1.To define American Diabetes Association guidelines for diagnosis and monitoring of diabetes mellitus. 2. To recognize common complications in diabetic patients. 3.To list examples of diet and treatment modalities suggested for diabetic care.	To apply the information gathered about proper diabeti care to educate the community.	Dr. Shaheen Banu Shaikh, Diabetic clinic	e-Portfolio, Short projects
3	Geriatrics	1. To describe theories of	To plan and Recom-	Dr. Prithvi	Create e-

		aging. 2. To detect common abnormalities in geriatric individuals from their lab reports.	mend modifications in lifestyle, diet and supplement usage for healthy aging in populations	Nandalike, Dept. of Geriatric medicine	posters, Seminars Problem solving exercises
Sl. no.	Elective subject	Learning objectives	Learning outcomes	Faculty mentors	Assessment methods
4	Community Nutrition	1. To demonstrate use of nutritional assessment methods. 2. To outline national nutritional policies. 3. To identify common nutritional problems in India.	To employ the nutritional assessment methods in different populations for identifying nutrition-related problems and to plan strategies to solve the problems	Dr. Shubankar Adhikari and Poulomi Chatterjee, Dept. of Community medicine	Create short educational videos, Short answer questions
5	Environmental studies	1. To describe the activities of the Centre for Environment studies. 2. To collect information about the ground water testing methods used.	To devise ways to overcome problems associated with poor water quality and to plan environment-friendly activities.	Dr. Bhagya Sharma, Centre for Environment studies	Short project, e-poster
6	Bioinformatics	1. To explain goals of Bioinformatics. 2. To describe the tools used for sequencing and analysis.	To plan and employ the tools for solving research problems.	Dr. Shyam Prasad Rao, Dept. of Bioinformatics	Short answer questions

7	Stem cell research	1. To explain goals of stem cell research. 2. To discuss methods used for isolation characterization and differentiation of stem cells.	To discover the potential of stem cells for therapeutic purposes.	Dr. Sudhir Shenoy, Dept of Stem cell research	Objective type questions, Assignments
Sl. no.	Elective subject	Learning objectives	Learning outcomes	Faculty mentors	Assessment methods
8	Prevention of substance abuse	1.To indicate adverse effects of tobacco/ nicotine on various body systems. 2.To state the National laws/ egulations governing substance abuse. 3. To discuss modalities used in tobacco cessation clinic.	To plan and design projects to improve effectiveness of substance abuse prevention programs.	Dr. Maji Jose, Centre for Prevention of substance abuse	Create short educational videos, Short answer questions
9	Gender equity and maternal health care	1. To describe the barriers due to gender inequality in maternal health care. 2. To list the complications during perinatal period and discuss ways to avoid them.	To formulate strategies to promote gender equity and maternal health care	Dr Saiqa R Shah, Dr Raghavendra U, Dept of Biochemistry	Create short educational videos, e-posters Short answer questions

Teaching and learning methods

Following methods are used to facilitate learning and training of PG students during II and III year (Post Graduate Course proper).

1. **Post graduate lectures, tutorials, seminars:** To update on various aspects of basic and clinical biochemistry & impact of molecular biology on advances in medicines.
2. **Journal club:** To develop (a) skills of analysis, evaluation and presentation of research papers (b) familiarity with approaches and methodologies of research and (c) to update on new development/emerging trends in biochemistry.
3. **Practical exercises:** under the supervision of a faculty.
4. Participation in UG laboratory practical teaching and problem based tutorials as a team with faculty of the department to gain in depth learning, teaching and tutoring experience.
5 . **Specialized training in Clinical Biochemistry:**

1 month posting in each year of 2nd and 3rd year MSc, in the clinical biochemistry laboratory to learn sample collection, quality control methods, setting up of a clinical biochemistry laboratory, specialized assays, statistical analysis of data

7. Environmentally sustainable good laboratory practices

(as the last topic under Theory Paper III- Clinical Biochemistry and Nutrition)

Assessment

1. At the end of Ist year (Preliminary Course)

Same as I MBBS as per latest M.C.I. regulations, except that there will be University Examination only in Theory and not in Practicals at the end of the one year course.

a) Internal Assessment examination:

Three internal theory Exam – 50 marks each

b) University examination

Eligibility- A minimum of average 50% marks in internal assessment is mandatory for appearing in the university exam and 75% of attendance.

Theory paper marks (80) + Internal marks (20) = 100 marks

2. MSc Medical Biochemistry postgraduate (2nd year and 3rd Year)

a) Internal Assessment examination

Three internal assessment will be conducted each year –

- Theory paper for 80 marks and Theory Viva for 20 marks – Total 100 marks
- Practical exam for 50 marks

b) University examination [At the end of III year (Final Year)]

Eligibility- A minimum of average 50% marks in internal assessment is mandatory for appearing in the university exam and 80% of attendance.

a. Theory examination: Theory marks (300) + Internal assessment marks (25) = 325
   Question paper pattern: Three papers 100 mark each with the duration of 3hrs for each paper. [Passing marks 50% of total ie; 150/300]

b. Practical examination: Practical marks (100) + Internal assessment marks (25) = 125
   Practicals: Duration- 2 days

c. Theory Viva: 50 marks

Total Marks = 325+125+50 = 500

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Recommended Books

1. Biochemistry Ed Lubert Stryer. W.H. Freeman and Company, New York.

2. Principles of Biochemistry. Ed Lehninger, Nelson and Cox. CBS publishers and distributors.

3. Harper's Biochemistry. Ed. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell. Appleton

and Lange, Stamford, Connecticut.

4. Textbook of Biochemstry with Clinical Correlations. Ed. Thomas M. Devlin.Wiley-Liss Publishers.

5. Genes VI. Ed Benjamin Lewin. Oxford University Press.

6. Tietz Textbook of Clinical Chemistry. Ed Burtis and Ashwood. W.B. Saunders Company.

7. Principles and techniques of practical biochemistry. Ed Keith Wilson and John Walker. CambridgeUniversity Press.

8. Biochemistry. Ed Donald Voet and Judith G. Voet. John Wiley & sons, Inc.

9. Molecular Cloning- A Laboratory Manual. J. Sambrook, E.F.Fritsch and T.Maniatis. Cold Spring Harbor Laboratory Press.

10. Molecular Cell Biology, H. Lodish, A. Berk, S.L.Zipursky, P. Matsudaira, D. Baltimore, J. Darnell

11. Bio-technology 1st edition. U. Satyanarayan. Books & Allied Publisher (p) Ltd.Kolkatta.

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Blue print for 1st year MSc Biochemistry theory question papers

Sl. No.	Section/Topics	Weightage (%)	Marks allotted
1	Metabolism (all pathways)	27	22
2	Genetics & Molecular Biology	15	12
3	Enzymes	9	7
4	Biomolecules	9	7
5	Digestion & Absorption	6	5
6	Hemoglobin & Plasma Proteins	9	7
7	LFT & KFT	6	5
8	Nutrition, Vitamins & Minerals	9	7
9	Biochemical Techniques	4	3
10	Cell Structure	6	5
		Total Marks	80

Blue print for Final year MSc Biochemistry theory question papers

Paper 1 (Chemistry and Techniques)

Sl. No.	Section/Topics	Weightage	Marks allotted
1	Techniques in Biochemistry	40	40
2	pH, Buffers, Henderson–Hasselbalch equation	10	10
3	Enzymes	10	10
4	Chemistry of amino acids and proteins, Basic concepts of immunology	10	10
5	Chemistry of carbohydrates	10	10
6	Chemistry of lipids:	10	10
7	Nucleic acids	10	10

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Paper 2 (Intermediary Metabolism)

Sl. No.	Section/Topics	Weightage (%)	Marks allotted
1	Molecular biology, Gene Expression & Regulation	20	20
2	Carbohydrate metabolism	20	20
3	Amino acid metabolisms	10	10
4	Lipid metabolism	10	10
5	Purine & pyrimidine metabolism	10	10
6	Regulation of metabolisms	10	10
7	Methods of investigation of metabolic pathways	10	10
8	Protein degradation & muscle contraction	10	10

Paper 3 (Clinical Biochemistry and Nutrition)

Sl. No.	Section/Topics	Weightage	Marks allotted
1	Acid base balance and electrolyte balance	20	
2	Vitamins and Mineral metabolism, Nutrition & protein energy malnutrition	20	
3	Hemoglobin structure, function, metabolism and abnomalites	10	
4	Endodrinology	10	
5	Composition of blood plasma in health disease and normal values, Biochemical investigations of Liver Kidney and Gastric Functions Test and inherited metabolic disorders	10	
6	Xenobiotics, Diagnostic enzymology and Acute phase proteins	10	
7	Cell, Cell membrane and Cell biology, AIDS, Alzheimer;s disease, Prions, beta amyloid	10	
8	Laboratory Management	10	

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MODEL QUESTION PAPER

YENEPOYA (DEEMED TO BE UNIVERSITY)

PRELIMINARY M.SC MEDICAL DEGREE

EXAMINATION

HUMAN BIOCHEMISTRY

Exam Date: **Max Marks: 80**

Time: 3 Hrs Your answers should be specific to the questions asked.

Draw neat labeled diagrams wherever necessary.

LONG ESSAYS **(2x10=20Marks)**

1. Describe the process of Glycol sis Explained products and energetic of aerobic and anaerobic glycolysis.
2. Write in detail sources, its pro vitamin form, RDA, metabolism, biochemical function, deficiency manifestation associated with vitamin A.

SHORTESSAYS **(8x5=40Marks)**

3. Name three ketone bodies. Enumerate the reactions of keton body synthesis.
4. Describe the mechanisms of respiratory regulation of acid base balance
5. What is competitive enzyme inhibition? Mention its salient features and give examples
6. List the function of kidney. Enumerate biochemical investigations to detect kidney dysfunction
7. Polymerase chain reaction-principle, procedure and its application
8. Describe the sources, biochemical function, coenzyme form and deficiency manifestation of thiamine
9. Define transamination, mention its salient features and its significance
10. Denovo synthesis of purine and pyrimidine nucleotides.

SHORTANSWERS **(10x2=20Marks)**

11. Zinc containing enzyme

12. Blood buffers

13. Iso enzymes

14. Essential fatty acids

15. Biologically important peptides

16. Southern blotting

17. Hetero polysaccharides

18. Two plasma proteins and their functions

19. Types of RNA and their functions

20. Uncouplers of oxidative phosphorylation

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FINAL M.SC MEDICAL DEGREE

EXAMINATION

MODEL QUESTION PAPER BIOCHEMISTRY PAPER I

CHEMISTRYANDTECHNIQUES

Exam Date: **MaxMarks:100**

Time: 3Hrs

Your answers should be specific to the questions asked.

Draw neat labeled diagrams wherever necessary.

LONG ESSAYS (2x20=40Marks)

1. Explain the basic principles and steps involved in the polymerase chain reaction (PCR).Compare and contrast different types of PCR techniques. Discuss the applications of PCR

2. Outline the basic principles of mass spectrometry. Explain how tandem mass spectrometry (MS/ MS) is used for peptide sequencing. Discuss the advantages of mass spectrometry over traditional methods. (12+8)

SHORTESSAYS (6x10=60Marks)

3. Discuss the composition and importance of homopolysaccharides (6+4)

4. Explain the structure and functions of different RNAs(5+5)

5. Explain the procedure of fractionation of sub cellular organelles.(5+5)

6. Classify immunoglobulins. Discuss the differences between primary and secondary immune

responses

7. Discuss the principle and applications of ELISA

8. Discuss the composition and functions of phospholipids with suitable examples

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YENEPOYA (DEEMED TO BE UNIVERSITY) FINAL M.SC MEDICAL DEGREE EXAMINATION

MODEL QUESTION PAPER BIOCHEMISTRY PAPER II

INTERMEDIARYMETABOLISM

Exam Date: **MaxMarks:100**

Time: 3Hrs

Your answers should b specific to the questions asked.

Draw neat labeled diagrams wherever necessary.

LONG ESSAYS **(2x20=40 Marks)**

1. Write in detail the process of Protein biosynthesis (translation). Discuss posttranslational modifications and inhibitors of translation
2. Describedigestion,absorption,transportandstorageofLipids.Mentionthefunctions of phospholipids and lipoproteins

SHORTESSAYS **(6x10=60 Marks)**

3. Galactose and fructose metabolism including associated disorders.
4. Plasmaproteinsandtheirfunctions.Whatarethevariouslaboratorymethodstoestimateserum Proteins?
5. DescribetheprocessofDNAreplicationandmentioninhibitorsofreplication
6. Describereactionsofureacycleandassociateddisorders.Namevariousmethodstoestimat e blood urea
7. Write brieflyon a) protein degradation b) heat shock protein
8. Metabolic adaptation during starvation

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FINAL M.SC MEDICAL DEGREE EXAMINATION

MODEL QUESTIONPAPER BIOCHEMISTRY PAPER III

CLINICAL BIOCHEMISTRY AND NUTRITION

Exam Date: **MaxMarks:100**

Time:3Hrs

Your answers should be specific to the questions asked.

Draw neat labeled diagrams wherever necessary.

LONG ESSAYS **(2x20=40Marks)**

1. Describe the sources, daily requirement, absorption, transport, biochemical function and regulation of iron metabolism. What are the disorders associated with iron metabolism?
2. Name the blood buffers. Describe the role of lungs and kidney in maintenance of acid base balance. Add a note on disorders of acid base balance.

SHORTESSAYS **(6x10=60Marks)**

3. Reactive oxygen species and anti-oxidant defence mechanisms.

4. Bilirubin-Synthesis,Classifyjaundice-typesandassociatedlaboratoryfindings

5. Quality control system and laboratory management

6. Pyridoxine-Sources, biochemical functions and its deficiency manifestations

7. Balanced diet and nutritional disorders

8. Endocrine disorders and related biochemical investigations

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POSTGRADUATE LOG BOOK

Name of the Department:

Name of the Student:

Postgraduate Degree/ Diploma:

Academic Year:

Name and Designation of Guide:

Signature of the Student:

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CERTIFICATE

Certified that the content of this Log Book is a Bonafide work of .....

a postgraduate student in the Department of Biochemistry, Yenepoya Medical College, Mangalore for the academic year.

Signature, Name and Seal of Guide:
Date and Place:

Signature, Name and Seal of Professor and HOD:
Date and Place:

Signature, Name and Seal of Dean:
Date and Place:

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Personal Biodata

Paste recent Passport Size Photograph Here

1. Full name :

2. Date of birth :

3. Permanent address :

4. Contact No. :

5. Year of passing :

6. College :

7. Date of joining MSc Course/Roll No:

8. Expected month & Year of University Examination :

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Subject Seminars

Sl.No.	Date	Topic	Moderator signature

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Subject Seminars

Sl.No.	Date	Topic	Moderator signature

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UG Teaching by Postgraduate Students

SI.No.	Date	Work Done	Remarks

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UG Teaching by Postgraduate Students

SI.No.	Date	Work Done	Remarks

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Assessment of PG Student

MSc Medical Biochemistry

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	First Year	Second Year	Third Year
Duration			
Punctuality and Regularity			
Interpersonal Relations			
Quality of Experimental Work			
Performance in Seminar and Journal club Presentation			
Participation in Teaching Programme			
E- Learning Activities			
Overall Rating			
Remarks and Suggestions			
Signature of the Head			

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Miscellaneous

SI.No.	Date	Particulars	Remarks

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Miscellaneous

SI.No.	Date	Particulars	Remarks

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Skills Acquired / Instruments Handled

SI.No.	Date	Instrument / Technique	Place	Remarks

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Skills Acquired / Instruments Handled

SI.No.	Date	Instrument / Technique	Place	Remarks

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Project (To be filled in by the Guide)

Topic			
Guide			
Progress			
Satisfactory/Not Satisfactory			
Comments			

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ATTENDANCE DETAILS

ATTENDANCE	1ST YEAR	2ND YEAR	3RD YEAR	TOTAL	REMARKS