SRI BALAJI VIDYAPEETH

(Deemed to be University Declared u/s 3 of UGC act 1956)
Accredited by NAAC with 'A' Grade
Pondicherry – 607 402.
www.sbvu.ac.in

MAHATMA GANDHI MEDICAL COLLEGE & RESEARCH INSTITUTE, PONDICHERRY

FACULTY OF ALLIED HEALTH SCIENCES

M.SC MEDICAL LABORATORY TECHNOLOGY IN CLINICAL CHEMISTRY

2019 -20 ONWARDS

Department of Biochemistry

Mahatma Gandhi Medical College and Research

CHOICE BASED CREDIT SYSTEM (CBCS)

(As approved in the Academic Council at the meeting held on 22-05-2019)

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POLICY ON COURSES OFFERED UNDER FACULTY OF ALLIED HEALTH SCIENCES

PREAMBLE

Sri Balaji Vidyapeeth, Deemed to be University, established under Section 3 of UGC Act, 1956, Accredited by NAAC with A Grade offers various courses under the Faculty of Medicine, Faculty of Dentistry, Faculty of Nursing Sciences and Faculty of Allied Health Sciences.

"Allied Health Professions are a distinct group of health professionals who apply their expertise to prevent disease transmission, diagnose, treat and rehabilitate people of all ages and all specialties. Together with a range of technical and support staff they may deliver direct patient care, rehabilitation, treatment, diagnostics and health improvement interventions to restore and maintain optimal physical, sensory, psychological, cognitive and social functions." - Organization of International Chief Health Professions Officers (ICHPO).

In March 2011, the Ministry of Health and Family Welfare nominated the Public Health Foundation of India (PHFI) as its technical partner and constituted the National Initiative for Allied Health Sciences (NIAHS) secretariat with a mandate to develop a framework to improve allied health training, education and regulation in the country. (Yet to be notified by Government of India).

Sri Balaji Vidyapeeth has introduced several innovative need based courses under the Faculty of Allied Health Sciences at Undergraduate and Postgraduate levels keeping in mind the initiative of Ministry of Health & Family Welfare, Government of India. In an era marked by expanding global job opportunities, these courses are bound to create an awareness among the students to suit themselves in the Health Care Team. Curricula have been designed in an objective manner and are aimed at cognitive, affective and psychomotor domains of learning. Furthermore all courses are designed in Choice Based Credit System (CBCS) made to suit the convenience of the students.

The Undergraduate courses mainly concentrate in creating professionals who form the part of the Health Care Team. The role of these professional is to ably assist the doctor in treatment as well as prognosis and in many a times form the core professional of the team. The proficiency and competence of the Undergraduates is fortified by the promulgation of a unique internship cum research programme.

The Postgraduate courses mainly aim at shaping a graduate into a full professional. Also these postgraduate courses help the graduates as well as the postgraduates to acquire specific skills on various adjunct therapies and techniques.

POLICY ON ELIGIBILITY, ADMISSION, & COURSE DURATION OF PG COURSES

At Sri Balaji Vidyapeeth, we empower the departments of all the constituent colleges to contribute to the development of innovative, need, value based and job oriented courses taking into considerations the interests of the stake holders.

The Post graduate courses (PG) are presently being offered under the Choice Based Credit System (CBCS) mode as per the Guidelines of UGC. The duration of the course will be two years. 80 percent of attendance is mandatory for appearing at the University Examinations. The students should also complete a short duration project (in their areas of interest) and also maintain and submit a log book. The maximum time limit for completion of the course will be four years. However, the Dean / Principal, AHS has the discretionary powers to extend the course duration on valid grounds (Health, Maternity, Natural Disaster, etc.).

Eligibility for Admission

A candidate seeking admission in the M.Sc MLT in Clinical Chemistry Programme shall be completing the **BSc (MLT) degree from any University/ Institute recognized by UGC with 50%mark**

PAYMENT OF TUITION AND OTHER FEES

Every student shall pay tuition fee and other fee, as prescribed by the University, within the due date notified. The fees are subject to revision as per rules of the University. All fees, once paid to the University, will not be refunded or adjusted for any other purpose under any circumstance.

PROGRAMME OBJECTIVES:

At the end of the course the candidates must be able to:

- Acquire the knowledge and apply the concepts, theories and principles of laboratory science in their profession.
- To bring about an effective change in the laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement

CAREER PROSPECTS / PLACEMENT OPPORTUNITIES:

Academics, R & D Laboratories, Health care set up, corporate organization, Industries & Independent practice

SCOPE:

This post Graduate programme in Medical Laboratory Technology – Clinical chemistry gives an opportunity for specialized study in the field of Laboratory Technology for training BSc (MLT) students. Candidates who successfully complete MSc (MLT) course may be placed as :

I. Specialized technologists in Biochemistry or supervisors of clinical laboratories in hospitals.

II. Laboratory technologists /scientists/ consultants in Biomedical and research institutes

III. Teachers in training institutes of Medical Laboratory Technology

Other salient feature: There are only a few Universities in India offering MSc MLT in clinical chemistry, which is an upcoming branch. Many corporate laboratories industries and R & D centres are establishing branches in India in the recent past. There is always increased demand, competition & urge to improve their own quality. Many clinical laboratories now going for NABL accreditation and maintaining quality at low cost is being taken up as a challenge, especially in the field of clinical chemistry. Hence there is lot of scope and opportunity for those who are willing to perceive this course.

OUTLINE OF THE CHOICE BASED CREDIT SYSTEM (CBCS) FOR POST GRADUATE DIPLOMA PROGRAMME

Credit System Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (Hard core courses (core course) and Soft core courses (elective courses).This is to enhance the quality and mobility of the students within and between the Universities in the country and abroad.

Credit hours

16 Theory classes = 1 credit

32 Practical/Tutorial/Clinical training/Research project = 1 credit

Subjects	Credits
Each core subjects	4 Credits
Skill Enhancement course (SEC)	3 Credits
Generic Elective course (GEC)	3 Credits
Discipline Specific Electives (DSE)	3 Credits

Courses: The courses offered under this Programme of Study are represented as Hard Core courses (core course) and Soft Core courses (elective course).

a) Hard core course (core course): A Hard core course may be a Theory, Practical, clinical rotation/field work or Research Project Work which are compulsory component studied by candidate to complete the requirement of their programme**.**

b) Soft Core or Elective Course: Soft core Course may be Theory, Practical, field work, clinical rotation or Research Project Work which can be chosen from the list of courses offered by the department/CBCS under SBV/national centre for a particular programme of a study. Soft Course may be supportive to their discipline of study or providing an expanded scope or exposure to multiple disciplines of study to nurture the candidate's proficiency/skill.

i) Discipline Specific Elective (DSE) Course: An elective course which is supportive or related to the discipline/subject (i.e. supportive to hard core course) is called a Discipline Specific Elective (DSE) Course.

ii) Generic Elective (GE) Course: An elective course which is unrelated to the discipline/subject (i.e. unrelated to hard core course) to expand their knowledge chosen by a candidate is called a Generic Elective.

iii) Skill Enhancement Courses (SEC): This course chosen by candidate which provides additional value-based and skill-based knowledge to increase their employability.

CRITERIA FOR UNIVERSITY EXAMINATIONS ON COURSES OFFERED UNDER FACULTY OF ALLIED HEALTH SCIENCES

SCHEME OF EXAMINATION

1) **Attendance Requirements**: 80% hours of learning in each Core Subjects / Electives / Practical's /clinical rotation/Postings for appearing for the university exams.
2) **Minimum marks required to be eligible for University Examination**: 50% marks in the internal assessment (Theory / Practical) are required for the candidate to be eligible to appear in the University Examinations.
3) **Passing Minimum**: 50% aggregate both in theory and practical's including internal assessment marks is required for a candidate to pass in the University Examinations.
4) **Submission of Project and Record Note Books for practical examinations**

   Candidates appearing for practical examinations should submit bonafide Record Note Books and Project prescribed for practical examinations, otherwise the candidates shall not be permitted to appear for the practical examinations.

GRADING

Marks obtained by candidate	Equivalent grade letter	Grade descriptor	Grade point
85 % & above	O	Outstanding	10
75-84	A+	Excellent	9
65-74	A	Very good	8
60-64	B+	Good	7
55-59	B	Above average	6
50-54	C	Average pass	5
49 & below	F	Reappear	0
	AB	Absent	0

A student obtaining **Grade F** shall be considered failed and will be required to reappear in the examination.

Conversion formula for Percentage to CGPA

Percentage divided by 9.5 = CGPA

Award of Class

Class division will be based on CGPA grade
≥ 7.8 grade point = Distinction Division
≥ 6.8 and < 7.7 grade point = First class Division
≥ 6.3 and < 6.7 grade point = Second class Division
≥ 5.2 and < 6.2 grade point = Third class Division
< 5.2 and below – Fail

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all exams. The CGPA is the ratio of total credit points secured by a student in various courses in all exams and the sum of the total credits of all courses in all the University exams. It is expressed up to two decimal places.

Grade Point: It is a numerical weight allotted to each letter grade on a 9.5 point scale.

Transcript: Based on the credits earned, a transcript shall be issued to all the registered students after the completion of the program indicating the hours of study and structure of the curriculum delivery as prescribed in his/her curriculum and completed by the student. The transcript will display the course details, including course code, title, and number of credits, hours and type of contact hours in a non-semester.

INTERNAL ASSESSMENT

- Continuous Internal Assessment (CIA) for all AHS programs with a minimum of 4 Assessments per year.
- Internal Assessment will be done in each subject according to the scheme of examinations. The IA marks will be on the basis of performance in the assignment, class tests and practical test in the clinical areas.

Evaluation of Clinical Rotation

Lab, Clinical rotation/postings - To conduct practical's or viva based on the Heads of the concerned department's decision and the total 100 marks to be sent to COE through proper channel to find a place in the transcript.

Question Paper Pattern

The following question paper patterns shall be followed for CBCS pattern syllabi for the candidates admitted from the academic year 2019-20 onwards.

CORE SUBJECTS

For **POST GRADUATE DEGREE NON-SEMESTER PROGRAMME -** Each Core Subjects University Exam carries -100 marks of 80(Theory) + 20 (IA marks) which consists of

Theory – 80 marks			
I	Short Essay questions	10 (*2 choice)	8 x 10=80

The University duration of 80 marks – 3 Hours

ELECTIVE SUBJECTS

For all UG/PG/DIPLOMA NON SEMESTER **COMPULSORY, GENERIC & DISCIPLINE** Elective University Exam papers carries- 50 marks of 40 (Theory)+10 (IA marks) which consists of

Theory – 40 marks			
I	Short Essay questions	5 (*1 choice)	4 x 10=40

*** Number of choices given**

For **SKILL BASED ELECTIVES** from 2019-20 batch onwards all UG/PG/DIPLOMA AHS courses will have 40 marks as university Practical cum Viva examination & 10 marks as Internal Assessment = 50 marks.

50 marks of the **COMPULSORY, GENERIC, DISCIPLINE & SKILL BASED ELECITIVES** which will be converted to 100 marks in the transcript.

CONDONATION FOR SHORTAGE OF ATTENDANCE

Condonation of shortage of attendance in aggregate up to 10% in each Year may be granted by the college Academic Committee and as per regulations of university.

RESEARCH PROJECT: Candidates should carry out individual projects only. Research Project shall be allotted at the beginning of the first year. Faculty members of the respective colleges must serve as guides and Co- guides from the other institutions may be allowed. Research Project work in THREE copies have to be submitted to university 30 days before the actual schedule of the exam. Research Project report evaluation will be done and Viva-voce will be conducted by both the external and internal examiners during university practical examination for 50 marks

Components	**Marks (50)**
Research Project	30
Viva	20
Total	50

Examiners: 2 Internal, 2 external

External examiner should be a regular teaching faculty of any medical college with either a MD (Biochemistry, Laboratory Medicine) or MSc., PhD., (Biochemistry/MLT) and should be Associate Professor and above. Theory paper will be evaluated by both external and internal examiners.

Question paper setters: should be a regular teaching faculty of any recognized medical college with either a MD degree or M.Sc., PhD.,(Biochemistry or MLT).

Practical Duration: Two days

BOARD OF STUDIES:

MEMBERS:

External members:

1. Dr. Nandeesha T, Additional Professor, Department of Biochemistry, JIPMER, Pondicherry
2. Dr. Vinayagamoorthy, Associate Professor, Department of Biochemistry, IGMCRI, Pondicherry.

Internal members:

1. Dr. S. Sumathi, Professor& Head, Dept. of Biochemistry, MGMC&RI
2. Dr. Kulkarni Sweta, Associate Professor, Dept. of Biochemistry, MGMC&RI
3. Dr. R. Reeta, Associate Professor, Dept. of Biochemistry, MGMC&RI
4. Mr. K. Ramachandran, Tutor, Dept. of Biochemistry, MGMC&R

Course structure and Examination scheme

FIRST YEAR M.SC MEDICAL LABORATORY TECHNOLOGY IN CLINICAL CHEMISTRY

S. No	Course code	Category	Course Title	Hours / Non-Sem	Credit	University Marks	IA marks	Total marks
1	Hard core	Core theory- 1	General Biochemistry-I	64	4	**80**	**20**	**100**
2		Core theory- 2	General Biochemistry-II	64	4	**80**	**20**	**100**
		Core theory- 3	Molecular Biology	64	4	80	20	100
		Core theory- 4	Human Anatomy & Physiology	48	3	80	20	100
3		Core Lab-1	General Biochemistry-I	128	4	80	20	100
		Core Lab-2	General Biochemistry-II	128	4	80	20	100
4		Clinical Rotation	Clinical Rotation (Clinical Laboratory)	384	12	-	100	100
6	Soft core/ elective course	Discipline specific elective course	DSEC-01-Research Methodology and biostatistics	48	3	**40**	**10**	**50**
7		Generic elective course (to choose any one)	GEC- 01- Environmental Sciences GEC- 02-Basics of Hospital Administration GEC- 03- Lifestyle disorders	48	3	**40**	**10**	**50**
Total				976	41	560	240	800

Total Credit for one year duration = 41 Credits

Course structure and Examination scheme

SECOND YEAR M.SC MEDICAL LABORATORY TECHNOLOGY IN CLINICAL CHEMISTRY

S. No	Course code	Category	Course Title	Hours / Non-Sem	Credit	University Marks	IA marks	Total marks
1	Hard core	Core theory paper - 5	Endocrinology and Immunology	64	4	80	20	100
2		Core theory paper- 6	Clinical Chemistry	64	4	80	20	100
		Core theory paper- 7	Instrumentation and the laboratory management	64	4	80	20	100
		Core Lab-6	Clinical Chemistry	128	4	80	20	100
3		Core Lab-7	Instrumentation and the laboratory management	128	4	80	20	100
4		Clinical Rotation	Clinical Rotation (Clinical Laboratory)	288	9	-	100	100
5		Research Project		192	6	**50 (30+20 viva)**	**-**	**50**
6	Soft core/ elective course	Discipline specific elective course	DSEC-02- Biomedical Waste Management	48	3	**40**	**10**	**50**
7		Skill enhancement elective course (to choose any one)	SEC- 01- Basic life support SEC- 02-English for clinical communication GEC- 03- Basics of yoga and practice	48	3	**40**	**10**	**50**
Total				1024	41	530	220	750

Total Credit for two years duration = 82 Credits

Syllabus

CORE THEORY PAPER I: GENERAL BIOCHEMISTRY –I

UNIT I: Cell Biology & Biophysical Chemistry: Types of cells, structure and functions of cell organelles, Biological membrane- structure and functions, acids, bases, buffers, pH, Henderson Hassalbalch equation, diffusion, osmosis and osmotic pressure, Donnan membrane equilibrium, surface tension, and viscosity.

UNIT II: Chemistry &Metabolism of Carbohydrates:

Chemistry of Carbohydrates - Classification, structure, properties, and functions of Monosaccharides, Disaccharides, Oligosaccharides, and Polysaccharides, Glycoprotein and Proteoglycan.

Metabolism of Carbohydrates - Digestion, absorption and transport of carbohydrates, disorders in digestion and absorption ofcarbohydrates, glycolysis , Rapaport-Luebering cycle, formation and fate of pyruvic acid & acetyl CoA, Citric acid cycle, Metabolism of glycogen – Glycogenesis, Glycogenolysis, significance of HMP shunt, clinical importance ofuronic acid pathway ,metabolic pathwaysinvolved in gluconeogenesis, regulation of gluconeogenesis, metabolism of galactose, metabolism of fructose and sorbitol pathway, blood sugar level and regulation of blood glucose (homeostasis), Diabetes mellitus-classification, laboratory diagnosis, clinical presentation, complications of DM , diabetic ketoacidosis, glycogen storage disorders, galactosemia, fructosuria, hereditary fructose intolerance, glucose tolerance test- preparation, procedure, interpretation, glycated hemoglobin, fructosamine, and anhydroglucitol.

UNIT III: Chemistry &Metabolism of Lipids:

Chemistry of lipids: Classification, properties, structure and functions of simple, compound and derived lipids, essential fatty acids, prostaglandins.

Metabolism of lipids: Digestion, absorption and transport of lipids, lipid malabsorption, fatty acid oxidation, fatty acid synthesis, metabolism of ketone bodies, metabolism of cholesterol,

metabolism of phospholipids, plasma lipoproteins and their metabolism, adipose tissue metabolism, alcohol metabolism, Refsum's disease, Zellweger syndrome, ketosis, ketoacidosis, sphingolipidoses (sphingolipid storage disorders), fatty liver, familial hypercholesterolaemia , atherosclerosis -risk factors & prevention of atherosclerosis, hypolipoproteinemias, and hyperlipoproteinemias.

UNIT IV: Enzymology: Classification of enzymes, mechanism of enzyme action, kinetic properties of enzymes, factors affecting enzyme kinetics and enzyme inhibition.

UNIT V: Biological Oxidation&Xenobiotics:

Biological Oxidation - Components of electron transport chain (ETC) ,inhibitors of electron transport chain, oxidative phosphorylation , uncouplers of oxidative phosphorylation, clinical significance of brown adipose tissue and thermogenesis.

Xenobiotics– Detoxication, mechanism of detoxication , free radicals, and antioxidants (enzymes, vitamins and minerals)

CORE LAB 01: GENERAL BIOCHEMISTRY –I

List of Practicals:

- Laboratory safety : Fire, chemical, radiation ,handling of biological specimens, waste disposal regulations and workplace hazardous .
- Specimen collection, identification, transport, delivery and preservation. Patient preparation for tests.
- Anticoagulants and preservatives
- Regulations and precautions regarding transport of biological specimens pH determination
- Preparation of buffers
- Qualitative analysis of carbohydrate, Protein and amino acids, NPN, Verification of Beer's Lambert's law
- Normal and abnormal urine analysis
- Case discussion

METHODS OF TEACHING

1. Lecture cum discussion
2. Demonstration
3. Lab visit
4. Practical work record

METHODS OF EVALUATION

1. Written Test
2. Laboratory observation Book
3. Assignments
4. Oral Presentations

Reference Books

- Textbook of Biochemistry for Medical students- DM.Vasudevan-8th edition-2017
- Lehninger's Principles of Biochemistry –Nelson and Cox-7th edition-2017
- Text book of Biochemistry with clinical correlations - Thomas M. Devlin-7th edition.
- Biochemistry - Lubert Stryer-8th edition.
- Harper's Illustrated Biochemistry - Robert K. Murray et al-31st edition.
- Textbook of Clinical Chemistry and molecular diagnostics- Tietz-6th edition-2017
- Biochemistry - Voet& Voet-2018
- Lippincott's Illustrated Reviews: Biochemistry - Pamela C. Champe and Richard A. Harvey-7th edition-2017
- Clinical Chemistry in Diagnosis & Treatment - Philip D. Mayne-6th edition
- Clinical chemistry – Marshall-8th edition-2016
- Textbook Medical Biochemistry - Chatterjee& Shinde-8th edition
- Textbook of Biochemistry – Dinesh Puri-3rd edition
- Molecular Biology of the Cell - Bruce Alberts-5th edition
- Cell and Molecular Biology - . De Robertis, De Robertis Jr-8th edition
- Genes VIII - Benjamin Lewin-12th revised edition-2017
- Immunology – Roitt-8th edition
- Davidson's Human Nutrition – Geissler-12th edition.
- Textbook of Biochemistry – West & Todd-4th edition
- William's Textbook of Endocrinology-13th edition

MODEL QUESTION PAPER

M.SC MEDICAL LABORATORY TECHNOLOGY IN CLINICAL CHEMISTRY

Core theory paper I: GENERAL BIOCHEMISTRY –I

Time: 3 Hours **Maximum Marks: 80**

Illustrate your answers with suitable diagrams where ever necessary.

Short Essay questions :(any eight) 8 x 10 = 80 marks

1. Explain the fluid mosaic model of cell membrane with suitable diagram. Describe Active transport mechanism. (5+5)
2. Describe the process of Glycolysis. Explain the regulation & Energetics of Glycolysis. (6+4)
3. Describe the regulation of blood glucose.
4. Classify phospholipids with examples and mention their functions.
5. Outline the steps involved in the ß-oxidation of fatty acids. Add a note on energetics.(7+3)
6. What are the different types of enzyme inhibition? Explain with suitable examples.
7. Describe in detail about electron transport chain. Write a note about inhibitors of respiratory chain.
8. What is detoxification? List the stages of detoxification and add a note on role of cytochrome p450 in detoxification.
9. Classify enzymes. Explain in detail the factors affecting the velocity of an enzyme reaction.
10. Classify lipoproteins and mentiontheir functions. Describe the metabolism of HDL

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Core theory paper I: GENERAL BIOCHEMISTRY –I

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Unit No.	Unit	Marks Allotted	No. of questions
I	Cell Biology & Biophysical Chemistry	10	1
II	Chemistry &Metabolism Of Carbohydrate	20	2
III	Chemistry &Metabolism Of Lipids	20	2
IV	Enzymology	10	1
V	Biological Oxidation &Xenobiotics	20	2
	TOTAL	80	8

***Choice question can be taken from any unit**

Syllabus

Core Theory paper II: GENERAL BIOCHEMISTRY –II

Unit I: Chemistry and Metabolism of Proteins and Amino Acids:

Chemistry& Metabolism of Proteins and Aminoacids: Classification, properties, structural organization and denaturation of proteins, biologically important peptides, classification and properties of amino acids, functions of plasma proteins.

Metabolism of proteins and amino acids: Digestion, absorption and transport of amino acids, urea cycle and associated disorders, functions of polyamines, metabolism of individual amino acids and their inborn errors.

Unit II: Metabolism of Vitamins: Fat and water soluble vitamins- source, RDA, active forms, functions and deficiency manifestations.

Unit III: Metabolism of Minerals And Trace Elements: Source, RDA, functions and deficiency manifestation of sodium , potassium , chlorine , calcium , phosphorus, sulphur, iron , copper , magnesium, fluorine , zinc , manganese , chromium and selenium.

Unit IV: Energy Metabolism and Nutrition: Energy metabolism – Respiratory Quotient, Specific Dynamic Action of foods, Basal Metabolic Rate (BMR), dietary fiber, biological value of proteins, nitrogen balance, balanced diet, Recommended Dietary Allowance (RDA), Regulation of food intake, Disorders of nutrition - protein calorie (energy) malnutrition, metabolic syndrome and obesity, bulimia and anorexia nervosa.

Unit V: Chemistry And Metabolism Of Heme: Structure and functions of hemoglobin and their derivatives, Oxygen dissociation curves, hemoglobinopathies, types of anemia, other heme containing compounds – myoglobin, cytochromes. Metabolism: Biosynthesis of hemoglobin and associated disorders, Degradation of heme, jaundice – types, causes and laboratory diagnosis.

MODEL QUESTION PAPER

M.SC MEDICAL LABORATORY TECHNOLOGY IN CLINICAL CHEMISTRY

Core Theory paper II: GENERAL BIOCHEMISTRY –II

Maxmarks:80 Duration:3Hours

Short Essay Questions:(any eight) (8X10=80marks)

1. Explain the biochemical steps in urea cycle and add a note on hyperammonemia.
2. Write in detail about structural organization of proteins and briefly mention about various methods used in elucidation of primary structure.
3. Describe the sources, biochemical functions, RDA& deficiency manifestation of Vitamin D.
4. Describe the sources biochemical functions, normal requirement & deficiency manifestation of Vitamin C.
5. What is the normal serum level of Calcium? Describe the dietary sources, requirement, function and regulation of calcium level in human body.
6. Describe the dietary sources, daily requirement, functions and deficiency Manifestations of iron.
7. Explain the laboratory diagnosis of jaundice
8. Define BMR. Describe the various factors affecting BMR.
9. List the special product derived from glycine with suitable reactions. Add a note on metabolic disorders associated with Glycine metabolism.
10. Explain the steps of heme biosynthesis in the body. Add a note on Acute intermittent porphyria.

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Core Theory paper II: GENERAL BIOCHEMISTRY –II

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Unit No.	Unit	Marks Allotted	No. of questions
I	Chemistry and Metabolism Of Proteins And Amino Acids	20	2
II	Metabolism of vitamins	20	2
III	Metabolism of minerals and trace elements	20	2
IV	Energy Metabolism And Nutrition	10	1
V	Chemistry And Metabolism Of Heme	10	1
	Total	**80**	**8**

***Choice question can be taken from any uni**

CORE LAB 02: GENERAL BIOCHEMISTRY –II

List of Practicals:

- Chromatography : - Paper, Thin layer,- Separation of various sugars, amino acids.
- Electrophoresis :- Paper, Agarose gel -Separation of serum proteins, Hb
- Calculations of Normality and molarity
- Case discussion

SYLLABUS

CORE THEORY PAPER III: MOLECULAR BIOLOGY

UNIT I: Chemistry And Metabolism Of Nucleotides:

Components - Nucleotides, nucleosides and nitrogen bases. Biologically important nucleotides, synthetic nucleotides, Structure, types and functions of nucleic acids. **Metabolism:** Degradation of purine and pyrimidine nucleotides, salvage pathway, disorders of purine and pyrimidine metabolism

UNIT II: Cell cycle, DNA Replication, DNA repair mechanism

UNIT III:, Transcription, post-transcriptional processing, Translation, and post-translational modifications

UNIT IV: Regulation of gene expression, Genetic code, types of mutation with examples, Gene therapy

UNIT V: Molecular techniques- DNA isolation, PCR, blotting, RFLP, and Recombinant DNA

MODEL QUESTION PAPER

FIRST YEAR M. SC. MLT IN CLINICAL CHEMISTRY CORE THEORY PAPPER-III- MOLECULAR BIOLOGY

Time: 3 hrs **Max Marks: 80**

Short Essay questions : (any eight) 8 x 10 = 80 marks

1. Describe the Watson and Crick model of DNA structure with suitable diagram.
2. Explain the catabolism of purine nucleotides. Add a note on Gout.
3. Describe translation with suitable illustration and mention the inhibitors of translation.
4. Describe transcription with suitable illustration. Enumerate the inhibitors of transcription.
5. Explain the various types of DNA repair mechanisms with examples.
6. What is mutation? Write about different types of mutations with suitable examples.
7. Define Blotting. Explain the southern blotting techniques with applications.
8. Discuss in detail recombinant DNA technology and its clinical application.
9. Describe the Lac operon concept of gene regulation.
10. Explain the salient features of genetic code.

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Core Theory paper II: GENERAL BIOCHEMISTRY –II

Unit No.	Marks Allotted	No. of questions
I	20	2
II	10	2
III	20	2
IV	10	1
V	20	1
	80	8

***Choice question can be taken from any unit**

Core theory Paper-IV- Human Anatomy and Physiology

Section –A- Human Anatomy - Syllabus

OBJECTIVES:

- **To identify and relate basic concepts of structure and functions of cells, tissues and organs.**
- **To understand the anatomical organization, coordination and integrated functions of different systems of human body.**

UNIT I: General Anatomy, Histology and Embryology:

General Anatomy and Histology: Anatomical planes, Terms and Terminology, Structural classification of bones, development and growth of skeletal tissue and bones,Structural and functional classification of joints, General morphology of a synovial joint and associated structures.

General Histology: Structure and location of epithelial, connective and nerve tissues.

General Embryology: Spermatogenesis, Oogenesis, Fertilization, Germ layers, Development of the placenta

UNIT II: DIGESTIVE AND EXCRETORY SYSTEM

Digestive system: Macroscopic features of the mouth, salivary glands, pharynx, oesophagus, stomach, small and large intestines, liver pancreas, Biliary system and peritoneal cavity.

Urinary System: Macroscopic featuresof the kidneys, ureters, urinary bladder and the urethra.

UNIT III: CARDIOVASCULAR SYSTEM

Heart: Chambers of the Heart – Structure and Valves, Conducting system of Heart, Blood vessels

UNIT IV: ENDOCRINE SYSTEM - Macroscopic features, location and basic function of the hypothesis cerebri, thyroid gland, parathyroid glands, suprarenal glands, pineal gland and organs with a minor endocrine function.

UNIT V: REPRODUCTIVE SYSTEM :

Male Reproductive System: Macroscopic features, and location of the scrotum, testes, epididymis, ductus deferens, seminal vesicles, prostate gland, bulbourethral gland and penis.

Female Reproductive System: Macroscopic features and location of the ovaries, uterine tubes, uterus, vagina and external genitalia.

REFERENCE BOOKS:

1. SampathMadyasthaw, "Manipal Textbook of Human Anatomy", 3rd Edition.

BLUE PRINT

Section A – Human Anatomy

Each question paper should have:

5 Short Essay questions (10 mark of each)
Out of 5 (4 questions should be answered) 4 X 10 = 40

Section A

GIT, Excretory System, Cardiovascular System, Endocrine, Reproduction, General Anatomy, General Histology And Embryology

APPLIED TYPE: 10% RECALL TYPE: 10%UNDERSTANDING TYPE: 80%

MARKS DISTRIBUTION: SHORT ESSAY -5 (1 CHOICE) = 40 MARKS

REGION	**MARKS DISTRIBUTION**	
	Understanding	**Applied /Recall**
Unit I: General Anatomy General Histology General Embryology	10	-
Unit II:GIT&Excretory		10
Unit III: Cardiovascular System	10	-
Unit IV: Endocrine	10	
Unit V: Reproduction	10	-
	40	10

Section B- Physiology Syllabus:

UNIT-I: General and cellular physiology: Overview of the structure organization of the human body,Cell and its functions including ,morphology, structure of cell membrane and transport across cell membrane.

UNIT-II: Blood and body fluids: Introduction to blood and plasma proteins along with the functions, functions of red blood cells, white blood cells, and platelets, blood groups; Immunity: classification and functions.

UNIT-III: Cardiovascular system: Organization of cardiovascular system, cardiac muscle properties and functions; conducting system of heart; normal electrocardiogram (draw and lebel different waves and segments; blood pressure: definition, normal range, factors regulating blood pressure.

Unit IV: Gastrointestinal system: Organization of GI system, structure and functions of different layers of GI tract, salivary glands; composition of saliva and functions; gastric secretion composition and functions; steps in HCL secretion and its regulation; exocrine pancreas, composition and functions of pancreatic juice; physiological functions of liver; digestion and absorption of carbohydrates, proteins and fats, GI motility.

Unit V: Excretory system: Functional organization of kidneys; physiological functions of kidneys (excretory and non- excretory);GFR definition, factors affecting and regulating GFR; tubular functions.

Section B- Physiology Blue print

REGION	Short Essay questions
UNIT-I: General and cellular physiology:	1
UNIT-II: Blood and body fluids	1
UNIT-III: Cardiovascular system	1
Unit IV: Gastrointestinal system	1
Unit V: Excretory system:	1
	4+1(choice)

Model Question Paper

FIRST YEAR M. SC. MLT IN CLINICAL CHEMISTRY

Core theory Paper-IV-Human Anatomy and Physiology

Time: 3hrs **Max.Marks:80**

Section A – Human Anatomy

Short Essay Question(*Answer any 4 questions)* (4x10=40)

1. Describe the Chambers of the heart and the arteries supplying it. (6+4)

2. Classify the bones according to its structure. Write a note on blood supply of long bone (7+3)
3. Enumerate the endocrine glands and explain the structure of Thyroid gland (3+7)
4. List the male reproductive organs. Explain the structure of testis and its blood supply.(3+7)
5. Describe the parts, relations and arterial supply of stomach. Add a note on its applied significance.(7+3)

Section B-Physiology

Short Essay Question (*Answer any 4 questions* (4x10=40)

1. Draw a lebelled diagram showing different parts of cell. Write in brief the functions of each cell organelle. (5+5=10 marks)

2. List the constituents of blood and write one function for each. Draw a lebelled diagram explain the steps of erythropoiesis. (4+6=10 marks)

3. Define blood pressure. Write the normal values of systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, and pulse pressure. Draw a lebelled diagram showing conducting system of heart. (2+3+5=10 marks)

4. Name the salivary glands. Write the composition and function of each constituent of saliva. (2+8=10)

5. Draw a lebelled diagram of nephron. Write in brief the excretory and non-excretory functions of kidney. (2+8=10 marks).

DISCIPLINE SPECIFIC ELECTIVE

SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE COURSE-01

RESEARCH METHODOLOGY AND BIOSTATISTICS **CREDIT 3**

UNIT I **10 HOURS**

Research Methodology : Meaning , objectives and types of research, research approaches, significance of research. Research and scientific methods, research process and criteria of good research Definition and identification of a research problem – Selection of research problem, Justification , theory , hypothesis , basic assumptions, limitations and delimitations of the problems.

UNIT II **9 HOURS**

Introduction of bio statistics – Meaning and its scope; Population and Sample, Parameter and Statistics; types of statistical data; Diagrammatic representation data; Mean, Median, Mode. Standard deviation. Coefficient of variation. Skewness and Kurtosis. Probability – Definition, Axioms of Probability; addition and Multiplication theorem.

UNIT III **9 HOURS**

Concept of correlation – Simple, Partial regression- Simple Methods of Association – Chi square test of association of attributes, Goodness of fit.

UNIT IV **10 HOURS**

Concept of Hypothesis – Null, Alternative Hypothesis. Type I and type II errors. Sampling distribution Standarderror t & F distribution; t test based on single samples, two sample mean. Paired samples, F test two sample variances f test for several mean (one way ANOVA only). Z – test for proportion – one sample, two sample, MS –excel support for above expression.

UNIT V **10 HOURS**

Framing proposal for acquiring grants: the question to be addressed – rationale and importance of the questionbeing addressed – Empirical and theoretical framework – Presenting pilot study / data or background information – Research proposal and time frame- Specificity of methodology- Organization of different phases of study- Expected outcome of study and its implications – Budgeting – Available infrastructure and resources –Executive summary

Text books and Reference materials

1. Bandarkar, P.L and Wilkinson T.S (2000): Methodology and Techniques of social Research , HimalayaPublishing House, Mumbai.

2. Copper, H.M.(2002) Integrating research: A guide for literature review (2nd Edition)California; Sage

3. Harman,E & Montages , L(Eds.)2007). The thesis and the book, New Delhi; Vistar.

4.Mukherjee, R(1989); the quantity of Life: Valuation in school research , Sage Publications, New Delhi.

5. Stranss, A and Corbin. J.(1990):Basis of Qualitative Research : Grounded Theory Procedures andTechniques, Sage Publications, California

ENVIRONMENTAL SCIENCE

NAME OF THE SUBJECT PAPER : ENVIRONMENTAL SCIENCE

DURATION OF THEORY CLASSES : 16 hrs

DURATION OF PRACTICAL SESSIONS : 32 hrs

EXAMINATION : 100 marks (80 U + 20 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ hrsYEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : II YEAR

UNIT-I (Renewable and Non — renewable resources**)**

The multidisciplinary nature of environmental studies — Definition, scope and importance — Need for public awareness.

1 Forest resources: Use and over-exploitation, deforestation, case studies.Timber extraction, mining, dams and their effects on forests and tribalpeople.
2 Water resources: Use and over-utilization of surface and ground water,floods, drought, conflicts over water, dams-benefits and problems.
3 Mineral resources: Use and exploitation, environmental effects ofextracting and using mineral resources, case studies.
4 Food resources: World food problems, changes caused by agriculture andovergrazing, effects of modern agriculture, fertilizer-pesticide problems,water logging, salinity, case studies.
5 Energy resources: Growing energy needs, renewable and non-renewableenergy resources, use of alternate energy sources, case studies.
6 Land resources: Land as a resource, land degradation, man induced Landslides, soil erosion and desertification.Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

UNIT-II (Ecosystems)

Concept of an ecosystem - Structur1e9 and function of an ecosystem Producers,

consumers and decomposers — Energy flow in the ecosystem-Ecological succession-Food chains, food webs and ecological pyramids —Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (Ponds, streams, lakes, rivers, ocean estuaries)

UNIT-III (Biodiversity and its conservation)

Introduction — Definition: genetics, species and ecosystem diversity

- Biogeographically classification of India
- Value of Biodiversity: Consumptive use, productive use, social, ethicalaesthetic and option values
- Biodiversity at global, national and local levels
- India as a mega- diversity nation
- Hot-spots of biodiversity-Threats to biodiversity: habitat loss, poachingof wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation ofbiodiversity

UNIT-IV (Environmental Pollution)

Definition- causes, effects and control measures of:

- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear pollution
- Solid waste Management: causes, effects and control measures of urbanand industrial wastes — role of an individual in prevention of pollution —Pollution case studies — Disaster management: floods, earthquake, cyclone and landslides.

UNIT-V

Social Issues and the Environment: From unsustainable to sustainable development — Urban problems and related to energy — Water conservation, rain water harvesting, watershed management —Resettlement and rehabilitation of people; its problems and concerns. Case studies - Environmental ethics: issues and possible solutions climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

- Wasteland reclamation — Consumerism and waste products —Environmental Protection Act — Air (Prevention and Control of Pollution) Act — Water (

Prevention and control of Pollution) Act — Wildlife Protection Act — Forest

Conservation Act - Issues involved in enforcement environmental legislation — Public awareness

- Human Population and the Environment: Population growth, variation among nations — Population explosion — Family welfare Programmes —Environment and human health- Human Rights - Value Education- HIV/ AIDS - Women and Child Welfare- Role of Information Technology in Environment and Human Health — Case Studies.

FIELD WORK

1. Visit to local area to document environmental assets- river/ forest/ grassland / hill / mountain
2. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds
4. Study of simple ecosystems- pond, river, hill slopes, etc.

TEXT BOOKS RECOMMENDED

1. Agarwal, K.C. Environmental Science, Nidi Publishers.
2. BharuchaErach, The Biodiversity of India, Mapin Publication.
3. Brunner RC, Hazardous waste incineration, McGraw Hill Publishers.
4. Iaclhav H, Environmental Protection and Laws, Himalaya Publication.
5. Odum EP, fundamentals of Ecology, WB Sannders Publication.

TEACHING LEARNING ACTIVITIES

The course content in Environmental Studies will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Field Visits

GENERIC ELECTRIVE COURSE 02

Basics of Hospital Administration

NAME OF THE SUBJECT PAPER : Basics of Hospital

AdministrationDURATION OF THEORY CLASSES : 64 Hrs.

EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs.

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : I YEAR

THEORY (DURATION 64 Hours)

COURSE OBJECTIVES

- To provide orientation about the hospital functions
- To familiarize students with the basics concepts of hospital management

UNIT: I ORGANISATION OF A HOSPITAL AND ITS DEPARTMENTS

1. Organogram
2. Vision, Mission & Values,Logo
3. Patient Service Points – Clinical & Non-Clinical (OPD's, A&E, MHC, Wards, ICU's, OT's, etc.)
4. Scope of Services (Medical & Supportive Services)

UNIT:II HOSPITAL POLICIES & PROCEDURES

1. Registration Process
2. OP/IP Billing
3. Admission Process
4. Discharge Process
5. Financial counseling
6. Visitors Policy
7. Feedback forms.

UNIT: III MEDICAL RECORS MANAGEMENT/LEGAL ASPECTS

1.Types of Medico legal cases
2.SOP's for handling MLC
3.Medical Records -Forms,consents, registers used in hospitals

UNIT:IV QUALITY MANAGEMENT

1. Quality - Brief Introduction
2. Code of Conduct for healthcare professionals
3.Patient rights & responsibilities
4. Incident Reporting
5. Quality Indicators
6. List of Licenses to be obtained to run a Hospital College
7. Accreditation – ISO/NABH/JCI

UNIT: VOCCUPATIONAL SAFETY

1. Biomedical Waste Management
2. Hospital Spill Management
3. Usage of PPE
4. Emergency Codes
5. Fire Safety Management
6. Hospital Infection Control

UNIT: VIORGANISATIONAL BEHAVIOUR

1. Communication with patients/health care professionals
2. Grooming standards
3. Time Management
4. Grievance Handling, Interdisciplinary Committee

5. Leadership

LEARNING OUTCOMES

Students will have an overview of hospital functions, processes and patient management.

GENERIC ELECTIVE 03
Lifestyle Disorders

NAME OF THE SUBJECT PAPER : Lifestyle Disorders

DURATION OF THEORY CLASSES : 64 Hrs.

EXAMINATION : 50 Marks (40 U + 10 IA)

NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs.

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : I YEAR

THEORY (64 Hours)

UNIT I Modern Life style disorders

Deskbound and sleeping habits, junk food, anxiety.Food poisoning, Acidity.

UNIT II Dietary disorders

Food groups and concept of a balanced diet, obesity, metabolic syndrome, hypertension- their causes and prevention through dietary and lifestyle modifications

UNIT III Social health problems

Smoking, alcoholism, drug dependence and AquiredImmuno Deficiency Syndorme (AIDS).

UNIT IV Gastrointestinal disorders

Stomach disorders-Gastritis, Ulcer, Amoebiasis, Constipation, piles

Common ailment- cold, cough, fevers, diarrhoea, constipation- their causes and dietary treatment

Learning outcomes:

To understand the relevance, significance and implications of lifestyle disorders for the betterment of human life quality

Text Books

1. Text book of Clinical Biochemistry- Carl. A.Burtis and Edward R. Ashwood
2. Text Book of Medical Biochemistry – Dr. M.N. Chatterjee and RaneShinde

Reference Books

1. P. Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic Excellence
2. Biochemistry with Clinical Correlation- Thomas M. Devlin

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER –V-ENDOCRINOLOGY AND IMMUNOLOGY

UNIT I: Hormones:Classification of hormones, mechanism of hormone action

UNIT II: Regulation of hormone secretion, metabolism, biological functions and disorders of - Hypothalamus & pituitary hormones, thyroid hormones & parathyroid hormones

UNIT III: regulation of hormone secretion, metabolism, biological functions and disorders of pancreatic hormones, adrenal hormones and gonadal hormones.

UNIT IV: Basic concept of immunology – structure and functions of immunoglobulins, T and B lymphocytes, antigen-antibody reactions, auto immunity and immunodeficiency.

UNIT V: Major histocompatibility complex (MHC), hypersensitivity reactions, monoclonal antibodies and their applications in the immunotherapy and immunological techniques

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER – V- ENDOCRINOLOGY AND IMMUNOLOGY

BLUE PRINT

Unit No.	Marks allotted	No. of questions
I	20	2
II	20	2
III	10	1
IV	20	2
V	10	1
Total	80	8

***Choice question can be taken from any unit**

MODEL QUESTION PAPER

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER-V- ENDOCRINOLOGY AND IMMUNOLOGY

Time: 3 hrs **Max Marks: 80**

Short Essay questions : (any eight) **8 x 10 = 80 marks**

1. Classify hormones. Explain the mechanism of action of group II hormones.
2. Describe the chemistry, biosynthesis and regulation of thyroid hormones in the body.
3. Describe the chemistry, biosynthesis and regulation of adrenal hormones in the body.
4. Explain the role of parathyroid hormones in blood calcium regulation.
5. Explain the laboratory diagnosis of acute and chronic pancreatitis.
6. Explain the different types of immunoglobulin with suitable diagram.
7. Explain the role of MHC in immunity.
8. Explain the hypersensitivity reactions.
9. Explain any four autoimmune disorders.
10. Explain the principle and applications of ELISA.

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER –VI-CLINICAL CHEMISTRY

UNIT I: Organ function test:. Liver, Gastric and pancreatic Function Tests, Renal Function Tests, Thyroid Function Tests, Adrenal and Gonadal function tests.

UNIT II::Water and Electrolyte Balance and Imbalance : Body water compartments, Electrolyte concentration of body fluid compartments, Regulation of electrolyte and water balance, laboratory diagnosis and disorders

Acid-Base Balance and disorders: Acids and bases, Respiratory regulation of pH, Renal regulation of pH, Anion gap, Metabolic acidosis, Metabolic alkalosis, Respiratory acidosis and Respiratory alkalosis.

Body Fluids: CSF, Amniotic Fluid, peritoneal fluid, ascitic fluid, pleural fluid - disorders andlaboratory diagnosis of body fluid analysis.

UNIT III: Clinical Enzymology: Enzymes and Isoenzymes of Clinical Importance–Cardiac biomarkers, Serum Enzymes in Liver Diseases, Serum Enzymes in Musculo-skeletal Diseases , Serum Enzymes in Bone Diseases , Enzymes as therapeutic agents,

UNIT IV: Inborn errors of carbohydrate, lipids and aminoacid metabolism**.**

UNIT V: Cancer biology and Tumourmarkers - Tumour markers- types and clinical significance, oncogene, and tumour suppressor gene.

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER – VI- CLINICAL CHEMISTRY

BLUE PRINT

Unit No.	Marks allotted	No. of questions
I	20	2
II	20	2
III	10	1
IV	20	2
V	10	1
Total	80	8

***Choice question can be taken from any unit**

MODEL QUESTION PAPER

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER-VI- CLINICAL CHEMISTRY

Time: 3 hrs **Max Marks: 80**

Short Essay questions : (any eight) **8 x 10 = 80 marks**

1. List the defense mechanism of acid base balance in the body. Describe the role of kidney in the maintenance of Acid Base balance.
2. Explain the hormonal regulation of fluid and electrolyte balance.
3. Describe the various renal functions tests.
4. What is Tumourmarker? Classify tumour markers with examples.
5. Describe the Glycogen storage disorder under following headings:
   a) Biochemical defect b) clinical features c) lab diagnosis
6. What are isoenzymes? Explain the kinetics of cardiac biomarkers.
7. Classify Liver function tests. Add a note on laboratory diagnosis of jaundice.
8. Describe the lipid storage disorder under following headings:

b) Biochemical defect b) clinical features c) lab diagnosis

9. Mention the biochemical defect and lab diagnosis in the following disorder of amino acid metabolism a) phenylketonuria b) alkaptonuria c) maple syrup urine disease d) albinism e) homocystinuria
10. Mention the composition of CSF. Add a note on lab diagnosis of CSF fluid in tubercular meningitis.

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER –VII-INSTRUMENTATON AND THE LABORATORY MANAGEMENT

UNIT I: Basics of Instrumentation:

- Centrifugation techniques- Principles, types, instrumentation and its applications.
- Chromatographic techniques- Principles, types, procedures and their application in biological systems.
- Electrophoresis- Principles, types, procedure and their applications in biological systems.
- Photometry- Principle, instrumentation, and applications of colorimeter, spectrophotometer, and ISE.
- Principles, Instrumentation and application of Radioimmunoassay (RIA), ELISA, chemiluminescence and flowcytometry.

UNIT II: Basic Principles of Clinical Laboratory:

Standardized clinical biochemistry laboratory set up, Laboratory safety, universal precautions for prevention and transmission of pathogens, biomedical waste management, Phlebotomy- WHO guidelines for blood collection, vacutainers, types of anticoagulants, urine preservatives, prevention of hemolysis, order of blood collection, sample acceptance and rejection criteria, storage and transportation of specimens, and sample stability.

UNIT III: Automation And Laboratory Information System (LIS): Types of automation-components, programming, advantages and disadvantages of continuous flow analyzers, discrete autoanalyzers, semi-automated analyzer, fully-automated analyzer, batch analyzer, random access analyzer, Advantages and disadvantages of LIS, applications of computer in clinical chemistry laboratory, reference range for clinical chemistry parameters and POCT.

UNIT IV: Laboratory Errors, Laboratory Statistics And Documentation In Clinical Chemistry Laboratory- Pre-preanalytical, pre-analytical, analytical(random & systematic errors) and post analytical errors, root cause analysis and their corrective and preventive action, CV, bias, standard operating procedure, quality manual, ISO 15189 2017 guidelines, Method validation, and laboratory audit.

UNIT V: Total quality management and laboratory accreditation- Quality assurance, quality assessment, quality control- internal quality control, external quality control, inter laboratory comparison, QC charts-westgard rules, concept of six sigma , accreditation and certification, NABL and CLSI guidelines.

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER –VII-INSTRUMENTATON AND THE LABORATORY MANAGEMENT

BLUE PRINT

Unit No.	Unit	Marks allotted	No. of questions
I	Instruments and the laboratory techniques	20	2
II	Basic Principles of Clinical Laboratory	10	1
III	Automation And Laboratory Information System (LIS)	10	1
IV	: Laboratory Errors, Laboratory Statistics And Documentation In Clinical Chemistry Laboratory	20	2
V	Total quality management and laboratory accreditation	20	2
	TOTAL	80	8

***Choice question can be taken from any unit**

MODEL QUESTION PAPER

SECOND YEAR M.Sc. MLT IN CLINICAL CHEMISTRY

CORE THEORY PAPER –VII-INSTRUMENTATON AND THE LABORATORY MANAGEMENT

Time: 3 hrs

Short Essay questions: (any eight) 8 x 10 = 80 marks

1. Explain the total quality management in the clinical chemistry laboratory.
2. List the Pre-analytical errors and their corrective and preventive actions
3. Explain the process of Laboratory audit
4. Explain the steps of implementation of Laboratory information system
5. Explain the steps of Method validation
6. Explain the various Sample transportation methods
7. List the different Types of anticoagulants with their mechanism of action
8. Explain lean six sigma application in laboratory
9. List the advantages of using vacutainers over conventional collection tubes
10. Explain the types, principle, advantage, disadvantage, of automation in laboratory

PRACTICAL - SECOND YEAR

Core lab 6: Clinical Chemistry(80 practical+20 IA)

- **Isolation of DNA**
- **SDS PAGE**
- **Effect of temperature on enzyme activity**
- **Effect of pH on enzyme activity**
- **Blood Glucose by GOD-POD method**
- **Estimation of the following with Preparation of standard graph :**
  - Serum total protein by modified Biuret method & Serum albumin by BCG method
  - Serum total cholesterol
  - Serum triglycerides
  - Serum Urea by DAM method
  - Serum Uric acid by Phosphotungstate method
  - Serum Creatinine by Jaffe`s method
  - Serum Bilirubin by Malloy & Evelyn method
  - Serum Calcium by OCPC method
  - Serum Phosphorus by Molybdate method
  - Serum AST, ALT by kit method
- **case discussion**

Core lab 7:Instrumentation and the laboratory management (80 practical+ 20 IA)

- **Estimation of the following with Preparation of standard graph :** Estimation of urinary Creatinine, urea, uric acid , protein, calcium,
- **Method validation and verification**
- **Quality control,**
- **Interpretation of LJ plots**
- **Calibration and trouble shooting**
- **SOP and audit**
- **Case discussion**

SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE COURSE-02

BIOMEDICAL WASTE MANAGEMENT

UNIT I: Introduction to hospital waste

- Definition classification of hospital wastes.
- Types and composition : Types of solids, liquids, sharps, blood and blood tissue, radioactive material, biological and chemical material.
- Hospital effluents: Nature and composition, Levels if generation in a small clinic nursing home, small and large hospital, storage of hospital waste; Types of bags and containers used for usage.

UNIT II: Biomedical Waste Management Guideline

- Requirement
- Documentation of Biomedical waste types and guidelines
- Biomedical wastes (Management & Handling) Rules , 1998; and amendments.

UNIT III: Principles of Biomedical Waste Management

- Segregation of biomedical waste.
- Handling and transport of hospital waste; Authorization and accidental spilling
- Methods/ treatments required for disposal of pathogens
- Waste disposal methods
- Techniques of waste management
- Protocols of HW management

UNIT IV: Waste prevention

- Waste reduction activities
- Waste recycling,

UNIT V: Biomedical Waste Treatment facility

- Introduction, location, land requirements,
- Coverage area, types of equipment
- Infrastructure requirements,
- Record keeping,
- Waste collection, transport and storage facilities, precautions required.

Text Books:

3. Sustainable Biomedical Waste Management, P.K.Behera, 2nd Edition .2008.
4. Biomedical Waste Management, R.RadhaKrishnan, 1st edition,2005
5. The environmental Protection Act, 1986

SKILL ENHANCEMENT ELECTIVE COURSE

SKILL BASED ELECTIVE COURSES – II YEAR
SEC-03 Basics of Yoga and Practice

NAME OF THE SUBJECT PAPER : Basics of Yoga and

PracticeDURATION OF THEORY CLASSES : 16 Hrs.

DURATION OF PRACTICAL SESSIONS : 32 Hrs.

EXAMINATION : 50 Marks (40 U + 10

IA)NO UNIVERSITY PRACTICAL EXAMINATION

DURATION OF THEORY EXAMINATION : 1 ½ Hrs.

YEAR IN WHICH THE SUBJECT PAPER IS TAUGHT : I YEAR

THEORY & PRACTICALS (DURATION 16 + 32 Hours)

Unit	TIME(HRS)	CONTENT
1	1	Introduction to Yoga philosophy, psychology and lifestyle
2	1	A brief outline of the history of Yoga.
3	1	Cultivation of correct psychological attitudes
4	1	Asanas : Definition, Types, scope and limitations of Asanas
5	1	Pranayamas and their significance in Yogic curriculum, Types & phases of Pranayama.
6	1	Dharna and Dhyana as the keys to unlocking human potential.
7	1	Study of various aspects of Yoga: Kriyas, Bandhas, Mudras
8	1	Yoga defined as “Integration” and “Harmony”
9	1	Meaning of the term “Positive Health”
10	1	Yoga, a tool to restore homeostasis
11	1	Integration of Yoga into Health Professions Education
12	1	Order of teaching the Yogic practices; Do’s and Dont’s of specific Yoga techniques.
13	2	Applied aspects of Yoga in various human activities like therapeutics, education and sports
14	2	Introduction to yogic concept of health and disease

Unit 15: Introduction to Yogic techniques: Methods and practices (32 hours)Asanas (26 hrs):

- Aruna Surya Namaskar
- Ardha – Padmasana/Padmasana
- ArdhakatiChakrasana
- Pada Hasta
- PavanaMuktasana
- Trikona
- Navasana
- Ardha – Shalabhasana
- Shalabhasana
- Makarasana
- Bhujangasana
- Dhanurasana
- Vakrasana
- Vrikshasana
- Ushtrasana
- Gomukasana
- Yoga Mudra.
- Natarajasana
- Chakrasana
- Sarvangasana
- Matsyasana
- Halasana
- Shavasana

Pranayama (6 hrs)

- Vibhaga Pranayama
- Pranava Pranayama
- Savitri Pranayama
- Chandra and Surya Nadi Pranayama
- Nadi – Shuddhi
- Sheetali and Sitkari

PRESCRIBED TEXT BOOKS

- Dayanidy G and Bhavanani AB. CYTER Practical Book. Pondicherry, India:Dhivyananda Creations;

2016.

- A primer of Yoga Theory – Dr Ananda BalayogiBhavanani, DhivyanandaCreations, Pondicherry-13
- Fundamentals of Yoga History- Compilation by MeenaRamanathan
- Basic Hatha Yoga lessons (Tamil) - Dr Ananda Balayogi and MeenaRamanathan,Puducherry

BOOKS RECOMMENDED FOR STUDIES AND REFERENCE

1. A yogic approach to stress-Dr Ananda BalayogiBhavanani, Ananda Ashram,Pondicherry
2. Asana, Pranayama, Mudra and Bandha. Swami Satyananda, Bihar School ofYoga, Monger
3. ASANAS : WHY? AND HOW? – by Shri. O.P. Tiwari. Kaivalyadhama, Lonavla.
4. Hatha Yoga practices of the Gitananda tradition by Dr AnandaBalayogiBhavanani
5. Ramanathan Meena. Applied Yoga: Applications of Yoga in Different Fields ofHuman Activities. 3rd Ed; Pondicherry, India: Sri Balaji Vidyapeeth; 2018
6. PRANAYAMA – by Swami Kuvalayananda. Kaivalyadhama, Lonavla.
7. Yoga and sports- Swami Gitananda and Meenakshi Devi, Ananda Ashram,Pondicherry

SEC 02 : ENGLISH

NAME OF THE SUBJECT PAPER	**: ENGLISH**
DURATION OF THEORY CLASSES	**: 16 hrs**
DURATION OF PRACTICAL SESSIONS	**: 34 hrs**
EXAMINATION	**: 100 marks (80 U + 20 IA)NO**
UNIVERSITY PRACTICAL EXAMINATION	
DURATION OF THEORY EXAMINATION	**: 1 ½ hrsYEAR IN WHICH**
THE SUBJECT PAPER IS TAUGHT	**: I YEAR**

SYLLABUS

(THEORY& PRACTICALS = 16 +34 Hours)

COURSE DESCRIPTION: This course is designed to build spoken and written Englishcompetency of the students needed to function effectively in academic setup.

OBJECTIVES: On completion of this subject, the student will be able to:

1. Speak and write grammatically correct sentences in English.
2. Develop effective writing skills.
3. Build fluency in English

UNIT : I GRAMMAR

1. Remedial Grammar : Parts of speech; Types of sentences, question tags
2. Modal verbs;
3. Tenses

4. Concordance

UNIT : II VOCABULARY

1. Word formation – prefixes and suffixes
2. Medical terminology
3. Words often misused or confused
4. Idioms and phrases

UNIT : III WRITING SKILLS

1. Letter writing - permission, leave and other official letters
2. Note making methods
3. Jumbled sentences - cohesion
4. Paragraph Writing

UNIT : IV SPOKEN COMMUNICATION

1. Pronunciation of commonly mispronounced words
2. Day to day conversation
3. Telephonic conversations
4. Group Discussions

UNIT : V LISTENING AND READING SKILLS

1. General Listening and reading comprehension

Textbook Recommended

1. Effective English Communication by Krishna Mohan and Meenakshi Raman, TataMcGraw – Hill Publishing Company Limited, New Delhi.

2. English for Colleges and Competitive Exams by Dr. R. Dyvadatham, EmeraldPublishers.