MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES AND TECHNOLOGY
JAIPUR

Syllabus

M.Sc. (Medical)BIOCHEMISTRY

(6 SEMESTERS P.G. DEGREE PROGRAM)

for.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

2023-24

Recommended by Joint meeting of BOS Non clinical/ Para clinical / Clinical at its meeting held on 03/03/2023 and approved by Academic Council at its meeting held on 28/04/2023.

Revised by Faculty of Medicine & Surgery on 29/04/2025 & approved by Academic Council at its meeting held on 01/05/2025

NOTICE

1. **The university reserves the right to make changes in the syllabus /books/ guidelines, fee-structure or any other information at any time without prior notice the decision of the university shall be binding on all.**
2. **The jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.**

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc.(Medical)Biochemistry

(6 SEMESTERS P.G. DEGREE PROGRAM)

1. Introduction:

The Master of Science in Medical field provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in consultancy, education, research.

Programme specific outcome: M.Sc. MEDICAL

POS 1 . The PG student should acquire basic skills in teaching medical/ para-medical students

POS 2. A post graduate student after undergoing the required training should be able to deal with the allied departments and render services in advanced laboratory investigations.

POS 3. The post graduate student should have knowledge about the principles of research methodology and self-directed learning for continuous professional development.

POS 4. The post graduate student should be able to carry out a research project from planning to publication and be able to pursue academic interests.

COURSE OUTCOME (CO) : At the end of the M.Sc. training programme in Biochemistry, the post graduate student should have acquired competencies in the following areas, as detailed below:

1. The student should be able to explain clearly concepts and principles of biochemistry and cell biology, including correlations of these with cellular and molecular processes involved in health and disease.
2. .The student should be able to effectively teach undergraduate students in medicine and allied health science courses, so they become competent health care professionals and able to contribute to training of postgraduate post graduate students.
3. The student should be able to set up/supervise/manage a diagnostic laboratory in Biochemistry in a hospital, ensuring quality control, and providing a reliable support service. The student should be able to provide clinicians with consultation services for diagnostic tests in biochemistry and in interpretation of laboratory results.
4. The student should be able to carry out a research project from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and to eventually be able to guide postgraduates in their thesis work.

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

9. ATTENDANCE:

Minimum 75 % attendance is required in each semester, both for theory and practical classes separately; student with deficient attendance will not be permitted to appear in university examination in that subject.

10. WORKING DAYS:

Each semester shall consist of not less than 120 working days including examination.

11. CONDUCTION OF THE UNIVERSITY EXAMINATION:

University semester examination shall be conducted twice in a year with an interval of six months. Even Semester examination shall be conducted after 6 months of odd semester examination

12. ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATION

Student is required to have minimum 75% attendance (in theory and practical separately) /to make him/her eligible to appear in University Examination in individual subject.

Candidates failing in one or more, subject in a semester will be required to appear in their failing subject in the next examination of the same semester next year.

The scheme of "Carry forward" (for the subjects in which the student has failed/ abstained) will be allowed for the current academic year in the universities and every student will be promoted to next semester/year. However, such students may clear the examination for the course in which he/ she has failed/ remained absent, whenever the examination is held next. Student will be allowed to appear in the END SEMESTER EXAM OF FINAL SEMESTER EXAMS ONLY IF HE/SHE HAS CLEARED ALL PERVIOUS SEMESTER AND INTERNAL EXAMS.
A candidate will have to clear all the subjects of First to Fifth semester before appearing at sixth semester university examination.

13. DISSERTATION

(i) Every student will be required to write a dissertation involving primary research in his/her area of interest. The dissertation includes a critical review of literature pertaining to the specific area of interest, data collection and analysis of the selected problem.

(ii) One faculty member will be assigned as Guide to each student.

(iii) Synopsis/protocol of the Dissertation shall be submitted by the student during the third semester to Institutional Ethics Committee (IEC).

(iv) Dissertation duly completed and signed by Guide shall be submitted to Principal, MGMCH, at least three months before the Sixth semester Exam.

(v) Dissertation will be examined during Practical Examination by all the examiners. Marks will be awarded as per the assessment done by these examiners.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

(vi) A student will be considered fit for award of degree only if the Dissertation is evaluated by the examiners.

14. APPOINTMENT OF EXAMINER & PAPER SETTER

- All the examiners - Paper setters, Theory examination answer books evaluators, External and internal Examiners for Practical examinations shall be appointed by the president of the University from the panel submitted by HOD/Convener of the respective BOS/COC through concerned dean of faculty.
- Paper setters for core subjects shall be external. He/She shall also evaluate answers sheets of his paper.
- For Elective courses paper setter and Evaluator shall be from the MGUMST itself.
- External Examiner will be invited from other recognized University/ Institution in the state of Rajasthan or outside the state of Rajasthan
- Practical examiner can be appointed to evaluate answers sheets.
- Professor/ Assoc. Professor /Assistant Professor/ having PG qualification (MD) and 5 years' teaching experience after PG in respective field OR M.Sc. with PhD having 3 years Teaching experience after PG in respective field is eligible to act as Internal/External examiner of theory/practical examination..

14. SCHEME OF EXAMINATION

The University examination for the Course shall be conducted semester wise at the end of every semester.

Continuous Assessment

Internal assessments will be conducted in the form of mid-term Examinations. Internal assessments will consist of departmental examinations, assignments, departmental posting, and evaluations.

Ability Enhancement courses (AEC)

The AEC from Semester I to V will be conducted and Evaluated by the respective departments. The marks will be sent to the principal's office by them after evaluation .

End of Semester Examination (EOSE)

(a) Each Theory paper examination from the Core subject shall be of 3 hours duration and of maximum 70 marks.

(b) Each Theory paper examination from the Elective shall be of 1 hr 30 Minutes duration and of maximum 35 marks

(c) There will be Five papers of theory in Each Semester.

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

I Theory

(a) There shall be five Theory papers in each semester of the study.

(b) Each Theory paper examination from the Core subject shall be of 3 hours duration and of maximum 70 marks.

(c) Each Theory paper examination from the Elective shall be of 3 hours duration and of maximum 70 marks.

(d) If a student fails in any paper in University Semester Examination, she/he will be allowed to write the exam whenever the next semester exam is conducted by the University till N+3 criteria is valid. For any subsequent attempt her/his Internal Assessment (IA) marks secured will be carried forward.

(e) Continuous Internal assessment (CIA) shall be of 30 for both core and elective subjects.

(f) The Paper Setter shall set the questions within the prescribed course of study of the concerned paper. There will be a set pattern of question papers duly approved by Academic Council.

Pattern of question papers (Annexure 1)

(g) Passing Marks: A candidate will have to obtain at least 50% marks including internal assessment in each theory paper to pass.

II. Practical and Viva-Voce Examination

At the end of semester VI there shall be practical and viva-voce examination of 140 marks. It shall be conducted after the Theory examination is over. A candidate will have to obtain at least 50% marks in practical and viva-voce examination

Semester	Practical /Dissertation Marks					Practical Examiners
	End of Semester Examination (EOSE)			Total Marks	Min. Pass Marks	
	Practical	viva-voce	CIA			
VI	100	40	60	200	100	Two Internal & Two External Examiner

(i) The practical examination will consist of skill test (long case), presentation on Dissertation and viva voce.

(ii) Board of Examiners for University Practical and Viva Voce Examination will be as under:

- 02 Internal Faculty
- 02 External Examiner

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

PRACTICAL, DISSERTATION AND GRAND VIVA AT THE END OF SIXTH SEMESTER OF 4 CREDITS OF 100 MARKS

III Result

1. A candidate will have to obtain at least 50% marks separately in each Theory paper including internal assessment and a minimum of 50% marks in the practical examination including viva-voce for him to be declared pass.
2. A Candidate who has failed in a subject(s) will reappear in respective paper(s) in next examination of the same semester next year.
3. Candidate who has failed in Practical examination will reappear in practical examination only.

IV. Supplementary/Remanded Examination

(a) There shall be a supplementary examination of VI semester only within two months of the declaration of the result of the main examination of VI Semester.
(b) Internal assessment marks obtained in main examination in the concerned failed paper(s) / practical shall be carried forward for working out the result of next Theory paper(s) and/or practical examination.
(c) A failing candidate, if opt for improvement his/her internal assessment marks shall be allow to do so. In case he does appear for improvement or gets lesser marks in internal assessment, his earlier marks will be considered for working out the result of the failing subject.

V. Promotion to Next Semester

1. A candidate who has passed or failed in one or more subjects shall be promoted to respective next semester.
2. A candidate will be allowed to appear for the VI semester examination only when the backlog of all papers (theory papers and practical) of I semester to V semester exams including elective papers (if any) is cleared.
3. The student is required to clear all the University examination within 6 years from the joining of the course .

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc. (Medical) Biochemistry Marks Distribution of Semester – I Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Anatomy	MSCM0223S101T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Physiology	MSCM0223S102T	4	70	30	100	
Biochemistry	MSCM0223S103T	4	70	30	100	
ELECTIVE COURSES (ANY TWO)						
National Healthcare System	MSCM0223S104T	2	70	30	100	
Basics of Computer	MSCM0223S105T	2	70	30	100	
Basics of Health Care IT	MSCM0223S106T	2	70	30	100	
ABILITY ENHANCEMENT COURSE						
Journal Club Presentation		1		50		
Practical Classes/ Lab Posting		1		50		
TOTAL		**20**	350	250	600	

for Sharma,
Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc. (Medical) Biochemistry Marks Distribution of Semester – II Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Pathology	MSCM0223S201T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Microbiology	MSCM0223S202T	4	70	30	100	
Pharmacology	MSCM0223S203T	4	70	30	100	
ELECTIVE COURSES(ANY TWO)						
Pharmacovigilance	MSCM0223S204T	2	70	30	100	
Communication Skills & Academic writing	MSCM0223S205T	2	70	30	100	
Legal and Medical Issues in Hospitals	MSCM0223S206T	2	70	30	100	
ABILITY ENHANCEMENT COURSE						
Practical (Lab Posting)		1		50		
Journal Club Presentation		1		50		
TOTAL		**20**	350	250	600	

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc. (Medical) Biochemistry Marks Distribution of Semester – III Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Chemistry & Metabolism of Proteins & Lipids	MSCM0223S301T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Chemistry & Metabolism of Carbohydrates & Nucleotides	MSCM0223S302T	4	70	30	100	
Biostatistics & Research Methodology	MSCM0223S303T	4	70	30	100	
ELECTIVE COURSES(ANY TWO)						
Organizational Behavior	MSCM0223S304T	2	35	15	50	
Stress Management	MSCM0223S305T	2	35	15	50	
Basic Instrumentation and Lab Practices	MSCM0223S306T	2	35	15	50	
ABILITY ENHANCEMENT COURSE						
Plan presentation		1				
Practical Classes/ Lab Posting		1				
TOTAL		**20**	**280**	120	**400**	

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc. (Medical) Biochemistry Marks Distribution of Semester – IV Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Bioenergetics & Intermediary Metabolism	MSCM0223S401T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Enzymology	MSCM0223S402T	4	70	30	100	
Nutritional Biochemistry	MSCM0223S403T	4	70	30	100	
ELECTIVE COURSES (ANY TWO)						
Database Management System	MSCM0223S504T	2	70	30	100	
Disaster Management	MSCM0223S505T	2	70	30	100	
Sports Nutrition	MSCM0223S506T	2	70	30	100	
ABILITY ENHANCEMENT COURSE						
Seminar Presentation		1		50		
Practical Classes/ Lab Posting		1		50		
TOTAL		**20**	350	250	600	

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc.(Medical) Biochemistry Marks Distribution of Semester – V Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Biochemical techniques	MSCM0223S501T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Clinical Biochemistry I	MSCM0223S502T	4	70	30	100	
Immunology	MSCM0223S503T	4	70	30	100	
ELECTIVE COURSES(ANY TWO)						
Professional Ethics and Human Rights	MSCM0223S504T	2	70	30	100	
Basics of Yoga	MSCM0223S505T	2	70	30	100	
Hospital Equipment Management	MSCM0223S506T	2	70	30	100	
PRACTICAL/ABILITY ENHANCEMENT COURSE						
Seminar Presentation		1		50		
Biochemistry Lab		1		50		
TOTAL		**20**	350	250	600	

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

M.Sc. (Medical) Biochemistry Marks Distribution of Semester – VI Examination

Course/Paper Name	Course/Paper Code	Credits	Theory/ Practical/Viva			
CORE COURSES			EOSE	CA	Total	Pass Marks
Molecular Biology	MSCM0223S601T	4	70	30	100	50 % aggregate including continuous assessment marks separately in theory and practical.
Clinical Biochemistry II	MSCM0223S602T	4	70	30	100	
Recent Advances & Quality Assurance	MSCM0223S603T	4	70	30	100	
ELECTIVE COURSES(ANY TWO)						
Biomedical Waste Management	MSCM0323S604T	2	70	30	100	
Teaching Methodology	MSCM0323S605T	2	70	30	100	
Basic Life Support (BLS)	MSCM0323S606T	2	70	30	100	
PRACTICAL/ABILITY ENHANCEMENT COURSE						
Practical /Viva and Dissertation Viva	MSCM0323S607P	4	160	40	200	
TOTAL		**22**	510	**190**	**700**	

16. REVALUATION / SCRUTINY:

Revaluation of answer book(s) and security of the marks shall be permissible as per the policy of the university.

17. AWARD OF DEGREE:

The degree shall be awarded by the University only after receipt of Course completion certificate and NO dues from the Head of Institution. (Principal of the college).

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

18. LETTER GRADES AND GRADE POINTS

LETTER GRADE	GRADE	PERCENTAGE OF MARKS
O (Outstanding)	10	100 %
A+(Excellent)	9	90-99.99 %
A(Very Good)	8	80-89.99 %
B+(Good)	7	70-79.99 %
B(Above Average)	6	60-69.99 %
C(Average)	5	50-59.99 %
F(Fail)	0	0 Less than 50 %
Ab (Absent)	0	0 Absent

19. Grades Qualifying for Pass:

Theory and Practical Examination

1. **Minimum 5 Grade** in the university examination and **5 Grade** in internal assessment evaluated by the department are required to pass **who fails to obtain 5 Grade shall be declared failed.**
2. A student obtaining **Grade F** shall be considered **failed** and will be required to reappear in the examination.
3. Letter Grade **Ab (Absent)** will be showing the absent of the candidate in examination and will be required to reappear in the examination.

20. Credit Weightage Distribution

Item	Credit Weight (30)
1.Internal Assessment (30.00%)	
Mid-term Exam	20
Class participation/presentation, Attendance	5
Departmental Postings, Assignment, quizzes	5
2.University Exam (70.00%)	
Total	**100**

21. Authority to issue transcript

The Controller of Examination of the University shall be the authority for issuing transcript after receiving the described fee from the candidate.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

22. Working Hours/Days

Duration	3 Years(6 Semesters)
Working Days	6 Days in A Week
Working Hours	36 Hours in A Week

23. Distribution of Courses Semester-Wise

Semester	Core Course Component (CCC)	Elective Course Component(ECC)	Practical / Ability Enhance Component	Total No. Of Courses/Papers
Semester I	3	2	2	5
Semester II	3	2	2	5
Semester III	3	2	2	5
Semester IV	3	2	2	5
Semester V	3	2	2	5
Semester VI	3	2	1	5
Total	18	12	11	30

24. Distribution of Courses in Each Semester

Sr. No.	Type of Course	Numbers
1	Core Course	3
2	Elective Course	2
Total	05 (Five)	

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

25. Types of Courses in M.Sc. (Medical) Biochemisry:

1. **Core Course**-course designed under this category aim to cover the basics that a student is expected to imbibe in the discipline of M.Sc. (Medical) Biochemistry. A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. **Elective Course**-it is a course which can be chosen from a pool of courses it is specific or specialized or advanced or supportive to the discipline of M.Sc. (Medical) Biochemistry. Students must **CHOOSE ANY TWO COURSE IN EACH SEMSTER** from the pool of course given to that semester.

3. **Practical/ Ability Enhancement Courses (AEC:** The Ability Enhancement (AE) Courses or practical are the courses based upon the content that leads to Knowledge enhancement. They are skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER I-PAPER I (THEORY)-

PAPER CODE-
MSCM0123S101T
MSCM0223S101T
MSCM0323S101T
MSCM0423S101T
MSCM0523S101T

ANATOMY

(1) Anatomical terminology, Anatomical planes, Anatomical positions, Clinical positions,Terms related to movements

(2) Musculoskeletal system:

(a)Bones & their classification, Morphology, ossification, blood supply

(b)Muscles: Morphology, classification, blood supply, innervations, functions

(3) Integumentary system: Thick Skin, Thin skin, layers of dermis & epidermis, Skin appendages, blood supply, innervations, functions

(4) Cardiovascular system: Morphology of blood vessels, classification of blood vessels, blood capillaries, blood circulation, functions

(5) Nervous system: Central Nervous system & Peripheral Nervous system, Gross basic Anatomy, Cranial nerves, Spinal nerves, Functions of nerves, Autonomic nervous system

(6) Lymphatic system: Formation of lymph, Lymphatic ducts, Thoracic duct, Lymph circulation, functions

(7) Digestive system: Parts of digestive system, gross anatomy and functions

(8) Excretory system: Parts of excretory system, gross anatomy of kidney, ureter, urinary bladder, and their functions

(9) Reproductive system: Male reproduction system- gross anatomy of penis, testis, epididymis, vas-deferens, seminal vesicles and prostate. Female reproductive system- gross anatomy of ovaries, uterine tube, uterus, vagina, menstruation cycle.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER I-PAPER II (THEORY)

PAPER CODE-
MSCM0123S102T
MSCM0223S102T
MSCM0323S102T
MSCM0423S102T
MSCM0523S102T

PHYSIOLOGY

CELL PHYSIOLOGY:

(1) Membrane transport, Bio-membrane potentials, Nernst equation,
(2) Composition of ECF and ICF, Goldmann equation.

NERVE-MUSCLE:

(1) Neuron (structure, functions and classification) and neuroglia,
(2) Action potential, neuromuscular junction,
(3) Skeletal muscle (structure, mechanism of contraction).
(4) Smooth muscle (structure, mechanism of contraction).

BLOOD:

(1) Function and composition,
(2) Erythrocytes,
(3) Hemoglobin,
(4) Blood groups,
(5) Leucocytes,
(6) Thrombocytes,
(7) Immunity (basics).

CARDIOVASCULAR SYSTEM:

(1) Cardiac muscle,
(2) Physiological Anatomy of heart and conduction system,
(3) Normal ECG, cardiac cycle, heart sounds,
(4) Cardiac output and blood pressure,
(5) Coronary circulation,
(6) Common symptoms of cardiovascular illness (basics only).

RESPIRATORY SYSTEM:

(1) Functional Anatomy of the respiratory system,
(2) Mechanism of breathing, dead space, surfactant, dynamic and static lung volumes and capacities,
(3) Transport of oxygen and carbon dioxide,
(4) Regulation of respiration: neural and chemical

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

(5) Cyanosis,
(6) Hypoxia,
(7) Oxygen therapy,
(8) Artificial respiration.

GASTROINTESTINAL SYSTEM:

(1) Functional Anatomy,
(2) salivary glands (secretion and functions of saliva, deglutition),
(3) Stomach (composition, regulation of secretion and functions of the gastric juice),
(4) Liver and its functions.
(5) Pancreas (secretion and function),
(6) Intestinal secretion (composition and functions), movement of intestines,
(7) Hormones of GIT (Basic only).

EXCRETORY SYSTEM:

(1) Functions of kidney,
(2) Juxta glomerular apparatus,
(3) Formation of urine, counter current mechanism,
(4) Role of kidney in maintenance of acid base balance,
(5) Renal function tests

AUTONOMIC NERVOUS SYSTEM:

(1) Organization of the ANS,
(2) Neurotransmitters,
(3) Effect of Sympathetic and Parasympathetic stimulation on different organ systems.

ENDOCRINE SYSTEM

(1) Introduction
(2) Enumerate the endocrine glands and their functions

REPRODUCTIVE SYSTEM

(1) Introduction
(2) Menstrual cycle, male/female sex hormones
(3) Methods of contraceptions.

CENTRAL NERVOUS SYSTEM

(1) General organization of CNS & PNS,
(2) Sensory system (general sensations, receptors, sensory pathways, sensory areas of brain)
(3) Motor system: (Spinal reflexes, reflex arc, corticospinal and extra pyramidal tracts
(4) Special senses

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER I-PAPER III (THEORY)

PAPER CODE-
MSCM0123S103T
MSCM0223S103T
MSCM0323S103T
MSCM0423S103T
MSCM0523S103T

BIOCHEMISTRY

BASICS OF BIOCHEMISTRY:

(1) Cell structure and function and transport through the biological membrane.

(2) Chemistry of Biomolecules – carbohydrate, lipids, amino acids, proteins and nucleicacids.

(3) Chemistry of Blood & Haemoglobin.

(4) Enzymes – Nature and classification, concepts, Kinetic, mechanism of action.

(5) Bioenergetics and Biological oxidation.

(6) Metabolism of Carbohydrates, Proteins, Lipids.

(8) Nutrition, Vitamins & Minerals.

(10) Molecular Biology.

(11) Organ function tests (Renal Function Tests, Liver function tests, Thyroid Function tests &pancreatic Function tests).

(12) Immunology – General outline

(14) Principles, working & applications of Basic Biochemical techniques: a) Colorimetry b) Spectrophotometry c) Chromatography d) Electrophoresis e) ELISA

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER II-PAPER I (THEORY)

PAPER CODE-
MSCM0123S201T
MSCM0223S201T
MSCM0323S201T
MSCM0423S201T
MSCM0523S201T

PATHOLOGY

INTRODUCTION TO PATHOLOGY:

(1) Definition
(2) Cause of cell injury
(3) Reversible and irreversible injury
(4) Pathologic calcification
(5) Cellular adaptations in brief.

INFLAMMATION AND REPAIR:

(1) Acute and Chronic inflammation
(2) Chemical mediators of inflammation

HEALING:

(1) By primary and secondary intention
(2) Factors affecting wound healing

HEMODYNAMIC DISORDERS:

(1) Edema
(2) Shock

NEOPLASIA:

Definition, Nomenclature

(1) Characteristic of benign and malignant neoplasm
(2) Metastasis in brief
(3) Carcinogenesis in brief.

HAEMOPOIETIC SYSTEM:

(1) Anemia
(2) IDA, Megaloblastic, Thalassemia, SCA, G6PD, deficiency, Hemophilia, Leukemia
(3) Lab investigation of hemorrhagic disorders.

LIVER:

(1) Liver function test, Jaundice, Hepatitis-B

KIDNEY:

(1) Stones, Nephrotic Syndrome, Renal Function Test

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

(2) ARF, CRF
(3) Glomerular nephritis in brief.

THYROID:

(1) Goiter, Thyroiditis
(2) Hypo and Hyperthyroidism

BONE:

(1) Osteomyelitis, TB
(2) Common Tumors

GALL BLADDER:

(1) Gall stones, Cholecystitis

BLOOD GROUPS AND COAGULATION

PANCREAS: Diabetes Mellitus, Pancreatic Function Test

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER II-PAPER II (THEORY)

PAPER CODE-
MSCM0123S202T
MSCM0223S202T
MSCM0323S202T
MSCM0423S202T
MSCM0523S202T

MICROBIOLOGY

(1) Cell Structure
   (a) Microscopy, staining,
   (b) Detailed structure in comparison to Eukaryotic cell, Morphological change during growth.

(2) Microscopy
   (a) Various optical methods available for viewing microorganism and their applications.

(3) Overview of Microbial Worlds
   (a) Basic principles and Purpose of Classification systems

(4) Growth Survival of Micro-organism
   (a) Growth
   (b) Growth parameters
   (c) Definition and measurement of bacterial growth
   (d) Survival of micro-organisms in natural environment
   (e) Role of antimicrobial agents.

(5) Cultivation of micro-organisms
   (a) Growth requirements
   (b) Sources of metabolic energy
   (c) Nutrition
   (d) Environmental and other factors affecting growth
   (e) Methods of cultivation

(6) Microbial Metabolism
   (a) Metabolism of biosynthesis and growth
   (b) Biosynthesis pathways

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

(c) Energy Yielding metabolism

(d) Regulation of metabolic pathways

(7) Bacterial Genetics

(a) Structure and replication of bacterial DNA plasmids

(b) Variation:

i. Mutation

ii. Transfer of genetic material

(c) Recombine DNA technology

(8) Control of micro-organism

(a) Sterilization & Disinfection

(b) Antimicrobial agents & bacterial resistance

(9) General Principles in clinical microbiology

(a) Collection and handling of various samples

(b) Laboratory safety

(c) Quality control

(d) Antimicrobial susceptibility and assay

(e) Laboratory animals-handling and care

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER II-PAPER III (THEORY)

PAPER CODE-
MSCM0123S203T
MSCM0223S203T
MSCM0323S203T
MSCM0423S203T
MSCM0523S203T

PHARMACOLOGY

GENERAL PHARMACOLOGY:

(1) Introduction to Pharmacology
(2) Nature and Sources of Drugs & Drug Information
(3) Dosage forms & Drug Nomenclature
(4) Routes of drug administration,
(5) Drug delivery systems
(6) Pharmacokinetics (Absorption, Distribution, Metabolism and Excretion of drugs)
(7) Therapeutic drug Monitoring
(8) Pharmacogenomics and Pharmacogenetics
(9) Drug receptors and Pharmacogenetics
(10) Factors Modifying Drug Action
(11) Drug administered in special situations: Pregnancy, Lactation, Pediatrics & Geriatrics.
(12) Adverse drug reactions & Pharmacovigilance
(13) Aspects of Pharmacotherapy & Clinical pharmacology
(14) Drug Interactions
(15) Drug development process and Regulations
(16) Rational Drug concept
(17) Essential drug concept
(18) Fixed Drug Combinations
(19) Evidence based Medicine

II Classification and pharmacological actions of drugs acting on various systems: -

1. Autonomic nervous system

2. Peripheral Nervous System

3. Central nervous system

4. Renal system

5.Cardiovascular System

6. Gastrointestinal system

7.Respiratory system

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

8.Uterine motility

III. Classification and pharmacological actions of

1. Autacoids and related drugs

2. Chemotherapy of microbial diseases

3. Antineoplastic agents

4. Immunomodulators

5. Drugs affecting blood

6. Hormones and Related drugs

7. Vitamins

RECOMMENDED TEXTBOOKS

- Goodman & Gilman's The Pharmacological Basis of Therapeutics, ed. Laurence Brunton, Bruce A. Chabner, Bjorn Knollman.
- Essentials of Medical Pharmacology, by KD Tripathi
- Basic and Clinical Pharmacology, by Bertram G. Katzung and Anthony J. Trevor

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER III-PAPER I (THEORY)

PAPER CODE- MSCM0223S301T

CHEMISTRY & METABOLISM OF PROTEINS & LIPIDS

Unit–I: Chemistry of Amino Acids & Proteins

- Structure, Classification and General properties of amino acids.
- Peptide bond–stability and formation, Primary structure, Secondary structure and motifs, αhelix,βsheet,3-10helix, Leucine zipper, Zinc finger, Tertiary & Quaternary structure.
- Biological importance of small peptides (glutathione, peptide hormones), Cyclopeptides (Gramicidin).
- Classification of proteins-globular, fibrous, membrane, metallo-protein.
- Denaturation, coagulation, refolding, Role of chaperones in folding.

Unit–II: Metabolism of Amino acids & Proteins

- Metabolic fate of dietary proteins and amino acids
- General reactions of proteins
- Formation & circulation of ammonia, Glucose alanine cycle, Ammonia Toxicity
- Urea cycle & its inborn errors
- Metabolism of amino acids
- Genetic defects in metabolism of amino acids

Unit–III: Chemistry of Lipids

- Classification & biological significance of lipids & fatty acids
- Steroids, Sterols, relation to vitamin D and steroid hormones
- Chemistry of lipids: Oils, waxes, isoprene units, Phospholipids, Lipoproteins, Glycolipids, Sphingolipids, Cerebrosides, Gangliosides, Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes

Unit–IV: Metabolism of Lipids

- Fatty acid biosynthesis, Desaturation of fatty acids
- Beta-oxidation, breakdown of odd chain fatty acids, energy yields, Regulation of β–oxidation, ώ–oxidation & α–oxidation
- Metabolism of phospholipids & Sphingolipids
- Regulation and Biosynthesis of cholesterol and other steroids
- Fate of acetyl CoA, formation of ketone bodies and ketosis
- Biosynthesis of prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- Lipoprotein metabolism
- Inborn errors of lipid metabolism

SEMESTER III-PAPER II (THEORY)

PAPER CODE- MSCM0223S302T

CHEMISTRY & METABOLISM OF CARBOHYDRATES & NUCLEOTIDES

Unit–I: Chemistry of Carbohydrates

- Classification of carbohydrates (monosaccharides, disaccharides, oligosaccharides and polysaccharides)
- Physical and chemical properties of carbohydrates.
- Biological importance of mucopolysaccharides

Unit–II: Metabolism of Carbohydrates

- Reactions, energetics and regulation of: Glycolysis, Gluconeogenesis, TCA cycle, Pentose phosphate pathway, Glycogen metabolism, Glucuronic acid cycle
- Anapleurotic reactions
- Metabolism of Galactose and fructose

Unit–III: Chemistry and Metabolism of NucleicAcids

- Purines, pyrimidines, nucleosides, nucleotides
- Structure and types of DNA & RNA
- Biosynthesis & Degradation of purines and pyrimidines
- Inborn errors of nucleotide metabolism

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

SEMESTER III-PAPER III (THEORY)

PAPER CODE-
MSCM0123S303T
MSCM0223S303T
MSCM0323S303T
MSCM0423S303T
MSCM0523S303T

BIOSTATISTICS & RESEARCH METHODOLOGY

i. Biostatistics: - Use of calculators and electronic spread sheets for understanding of: (1) Elements of data collection and presentation of data (2) Measures of central tendency and dispersion (3) Nonparametric tests (4) Parametric tests (including ANOVA) (5) Correlation and regression (6) Sampling techniques, randomization, sample size estimation. (7) Scales of measurement, data display, and measures of central tendency (mean, median, mode). (8) Dispersion of data (variance, standard deviation). (9) Selection of tests (of significance) and their applicability. (10) Correlation and regression analysis. (11) Statistical software.

ii. Research Methodology: -

1. Literature search and bibliography.
2. Data management and presentation.

Formulation of research topic, study design, blinding procedures and protocol

SEMESTER IV-PAPER I (THEORY)

PAPER CODE- MSCM0223S401T

BIOENERGETICS & INTERMEDIARY METABOLISM

Unit–I: Bioenergetics

- Laws of thermo dynamics, Gibbs free energy, relevance of entropy and Enthalpy in biological systems and reactions.
- Biological oxidation, high energy compounds, High energy bonds, redox and phosphate potential.
- Bioenergetics & biological oxidation – General concept of oxidation & reduction. Electron transport Chain (ETC) – functioning of ETC & inhibitors of ETC, Oxidative Phosphorylation, Uncouplers and theories of Biological oxidation & oxidative phosphorylation.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Unit-II: Intermediary metabolism

- TCA cycle
- Linking of urea & TCA cycle
- Metabolism during fasting & fed state
- Metabolism of starvation

SEMESTER IV-PAPER II (THEORY)- PAPER CODE- MSCM0223S402T

ENZYMOLOGY

Unit–I: Enzymes, Coenzymes and catalysis

- Nomenclature and classification of enzymes, co-factor, and co-enzymes
- Vitamin as cofactors
- Vitamin cofactors
- Factors affecting catalysis

Unit–II: Enzyme Kinetics

- Steady state, Michaelis-Menton kinetics (derive equation and transformations)
- Transformation of Michaelis-Menton equation.
- Enzyme Inhibition (competitive, uncompetitive, non competitive, suicide), effect on kinetic constants
- Enzyme inhibitors as drugs:RT and Protease inhibitors as anti-HIV drugs
- Suicidal inhibition, covalent modification, induction & repression
- Reversible and irreversible activation of enzymes (pro-enzymes, phosphorylation)
- Enzymes activation, Catalytic mechanism, Allosteric regulation
- Multi-enzyme Complex

Unit–III: Enzymes in Physiology and Biotechnology

- Regulatory enzymes of metabolism
- Enzyme cascades (blood clotting, complement activation, cell division and apoptosis
- Enzymes of diagnostic, prognostic & therapeutic importance.
- Isoenzymes & their diagnostic importance

SEMESTER IV-PAPER III (THEORY)- PAPER CODE- MSCM0223S403T

NUTRITIONAL BIOCHEMISTRY

Unit – I: Nutrition -I

- Balanced diet
- Calorific values of foods and their determination by bomb calorimeter.
- Specific dynamic action of foods
- Nutritional assessment by clinical testing; Anthropometric and Biochemical testing

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- BMR and RDA for infants, children, adults and pregnant and lactating mothers; Food fortification; probiotics
- Enzymes of digestive system, Hormones in digestion
- Role of bile acids
- Absorption; Control of food intake (leptin, ghrelin, peptide YY)
- Cholesterol, sodium and blood pressure
- Diet calculation, food toxicity.

Unit – II: Nutrition – II

- Protein factor in nutrition, glycemic index
- Role of carbohydrates, protein and lipids in diet
- Malnutrition (PEM, Marasmus, Kwashiorkor), Obesity (BMI and other metrics)
- Eating disorders; Anorexia and bulimia; Obesity and starvation.
- Diet and longevity, ageing, pregnancy and lactation, old age
- Composition and nutritive value of common foodstuffs

Unit – III: Macrominerals and Microminerals

- **Macro minerals-** Calcium, Phosphorus, electrolytes, distribution in the human body
- Physiology, function, sources, RDA, Regulation, deficiency and toxicity of Macrominerals
- **Micro minerals-** Iron, Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Sources, distribution in the human body
- Physiology, function, RDA, Regulation, deficiency and toxicity of microminerals.

Unit–IV: Chemistry and Metabolism of Vitamins

- Classification of vitamins
- Sources, biochemical functions, RDA and deficiency manifestations of fat and water soluble vitamins.

SEMESTER V-PAPER I (THEORY)- PAPER CODE-
MSCM0223S501T

BIOCHEMICAL TECHNIQUES

Unit–I: Spectroscopy

- Beer Lambert's Law, Molar extinction coefficient, Absorption maximum
- UV-Vis: Spectroscopy, Colorimetry–principle, instrumentation, application
- Fluorescence Spectroscopy–principle, Instrumentation, application

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- Atomic Absorption Spectrometry–principle, instrumentation, application
- NMR–principle, instrumentation application
- Mass spectroscopy principle, instrumentation, application
- X-ray crystallography

Unit–II: Chromatography and Electrophoresis

- Types of chromatography, principle, instrumentation, application of types of chromatography- PC, TLC, GC, Ion–exchange, Gel filtration(Gel exclusion chromatography), Affinity chromatography, HPLC and RP-HPLC, FPLC, LC,
- Peptide mapping and N-terminal sequencing of proteins
- Electrophoresis–moving boundary and zonal electrophoresis

Unit–III: Centrifugation

- Centrifugation, RCF and types of rotors
- Ultra centrifugation–principle, instrumentation, application

Unit–IV: Tracer Techniques

- Stable and radioactive isotopes, Radioactivity theory, half-life and emission spectra of Half-life of biologically useful isotopes
- Isotopes used for labelling proteins and nucleic acids
- Principle, application and hazards of radioactive techniques
- Diagnostic and therapeutic uses of radioisotopes
- Immunoassays: ELISA, RIA, CLIA, Immunodiffusion

SEMESTER V-PAPER II (THEORY)- PAPER CODE-
MSCM0223S502T

CLINICAL BIOCHEMISTRY I

Unit – I

- Physiological Interrelationship between cardiovascular, respiratory and renal systems
- Normal values for different blood tests and clinical implications
- Regulation of salt, electrolyte and water, Acid base balance and imbalance
- Diagnosis of anemia, thalassemia, hemoglobin metabolism & hemoglobinopathies
- Hyper cholesterolemia, atherosclerosis.
- Cardiac markers, diabetic profile
- Chemistry, composition and functions of lymph, CSF, ascitic, pleural & synovial fluids.
- Urine formation, excretion & urine analysis.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- Composition, chemistry & functions of specialized tissues like muscle, bone, nerve, connective tissue & brain adipose tissue.
- Biochemistry of Diabetes mellitus, regulation of blood glucose levels, Atherosclerosis, Fatty liver & obesity.
- Radioisotopes & their clinical applications.
- Lipid per oxidation, free radicals & antioxidants, Nitric oxide formation, metabolism& role in Medicine.
- Biochemical changes in aging and pregnancy & lactation.
- Neurochemistry in Health & Disease.
- Inborn errors of metabolism.
- Xenobiotics
- Environmental biochemistry

Unit – II: Organ function tests

- Liver, Renal, thyroid, pancreatic&gastricfunction tests

SEMESTER V-PAPER III (THEORY)- PAPER CODE-
MSCM0223S503T

IMMUNOLOGY

Unit – I: Components of the Immune System

- History of immunology
- Natural & acquired immunity, Specific & non-specific immune response.
- Cells & organs of immune system
- Antigenic determinants, Epitopes, Haptens, Properties of strong antigens
- Adjuvants – types, mode of action, and applications.
- Classification, structure, and biological properties of immunoglobulins
- Isotypes, allotype, idiotypes.
- Theories of antibody formation, Generation of antibody diversity
- Genomic rearrangements of light and heavy – chain loci in B-cells
- Genomic rearrangements in T-cell receptor, structure of CD3, CD4, CD8

Unit – II: Events in Immune Response

- Antigen – antibody reaction, mechanisms and regulation of immune responses.
- Humoral& cell-mediated immune response
- Activation of T cells & B cells
- Kinetics and regulation of primary and secondary immune response
- MHC proteins structure & functions
- Antigen processing & presentation

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- Transplantation immunology; Graft Versus Host Disease
- Complement fixation: pathways and biological consequences
- Discovery and action of Interferons
- Cytokines; Inflammation; Role in obesity, cancer
- Apoptosis
- Tumor immunology, biochemistry of cancer, tumor markers

Unit – III: Immune Disorders

- Types of Hypersensitivity; Coombs classification, Tests for diagnosis of hypersensitivity (Coombs), Tuberculin test
- Auto immune diseases; classification
- Immuno- deficiency disorders – primary and secondary deficiencies
- Gene therapy for ADA deficiency
- Immunology of AIDS
- Immunosuppressive drugs/agents & their mechanism of action

Unit – IV: Immunotechnology

- ELISA, RIA, CLIA
- Hybridoma technology – production of monoclonal antibodies; applications in research and immunotherapy; antibody engineering
- History and types of Vaccines; Conventional vaccines - killed, attenuated, and subunit Vaccines
- Modern vaccines; peptide, DNA, recombinant / vector, and anti-idiotypic vaccines
- Schedules of common vaccination, Benefits and adverse consequences of vaccination

SEMESTER VI-PAPER I (THEORY)

PAPER CODE- MSCM0223S601T

MOLECULAR BIOLOGY

Molecular Biology

Genetics

Unit–I: DNA Replication
Structure of DNA & RNA, DNA Replication- Initiation, Elongation, Termination, Inhibitors of replication (In Prokaryotes and Eukaryotes)

Unit–II: DNA Repair
Types of damage &DNA repair, Diseases due to defects in DNA repair, Genetic code, mutations and mutants

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Unit–III: Transcription & Translation
Transcription- Initiation, Elongation, Termination, Post transcriptional modifications.
Translation- Initiation, Elongation, Termination, post translational modifications, Inhibitors of protein synthesis.

Unit–IV: Protein Sorting, Targeting and degradation

Unit - V: Regulation of gene expression(In Prokaryotes and Eukaryotes), gene amplification

Unit – VI: Genetic Engineering

- Recombinant DNA technology & its applications, Genes and Chromosomes, Restriction endonucleases, Plasmids, cosmids, chromosome walking.
- Molecular markers- RFLP, AFLP etc.
- Molecular techniques- PCR, Botting techniques, FISH, Next generation sequencing etc.
- Gene mapping, Cloning, construction of Gene library, Gene cloning, strategies for screening DNA libraries.
- Human genome project

SEMESTER VI-PAPER II (THEORY)

PAPER CODE- MSCM0223S602T

CLINICAL BIOCHEMISTRY II

Unit–I: Endocrinology

- Organization and classification of hormones and endocrine systems
- Basic mechanism of action of peptide hormones and receptors, steroid hormones and receptors
- Chemistry, physiology, and disorders related to Hypothalamus-Pituitary axis, thyroid and parathyroid glands
- Glycoprotein hormones (LSH,FSH,TH,hCG,POMC)
- Growth hormone family (GH,hCS,Prolactin), Adrenal hormones, Gonadal hormones
- Regulatory pathways (positive, negative, feedback loops),Regulation of biosynthesis of steroid hormones by peptide hormones(LH,FSH,ACTH)
- Cancer & tumor markers

Unit II: Inborn errors of protein, carbohydrate, lipid & nucleic acid metabolism.

Unit–III: Hemoglobin metabolism& its Disorders

- Synthesis and breakdown of Hemoglobin
- Anemia, Hemoglobinopathies, Thalassemia, Porphyrias

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Unit- IV: Extracellular Matrix & Tissue Proteins in Health & Disease

Unit-V: Prenatal & Newborn screening for inherited metabolic disorders

SEMESTER VI-PAPER III (THEORY)

PAPER CODE- MSCM0223S603T

RECENT ADVANCES & QUALITY ASSURANCE

Unit I: Latest advances in clinical Biochemistry

- Laboratory Automation: Principle & Standard Operating procedures including calibration
- Use of Auto analyzers and Chemiluminiscent analyzers, dry chemistry
- ABG and Electrolytes analyzers
- Latest trends in Automation, Biochips, Lab on a chip (LoC)

Unit II: Laboratory Quality Management System

- Introduction to Quality control
- Quality laboratory processes, Quality assurance, Quality assessment, Quality control,
- Quality planning and Quality improvement
- Internal quality control, basic steps, sources of error and their correction methods,
- Sources of variation in laboratory results, CAPA - corrective action & preventive action
- Quality control charts, Levy- Jennings and Cusum charts, West guard Rules
- External quality control
- Current trends in laboratory accreditation, ISO certificate, West guard Rules

PRACTICAL / ABILITY ENHANCEMENT

Qualitative Analysis & Applied Biochemistry

- Demonstrate qualitative tests for carbohydrates, lipids, and proteins; identify biomolecules of biochemical importance.
- Identify commonly used laboratory apparatus and equipment; describe good laboratory practices, biomedical waste handling, and safety protocols.

Estimation of Protein in Foodstuffs

- Perform qualitative tests for detection of proteins/ carbohydrates in various foodstuffs (e.g., milk, pulses, egg, soya, cereals).
- Identify and compare protein-rich and protein-poor food items based on experimental data.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Urine Examination

- Describe and perform physical, chemical, and microscopic examination of normal and abnormal urine.
- Demonstrate dipstick method for rapid screening of urine constituents.
- Identify abnormal urinary constituents; interpret findings and correlate with pathological conditions; prepare a standard urine report.
- Describe urine screening for inborn errors of metabolism and explain the use of paper chromatography in detection.

Basic Concepts in Clinical Biochemistry Laboratory

- Describe estimation of pH using pH meter or ABG analyzer and interpret results through clinical case scenarios.
- Perform titration of simple acid-base reactions and calculate normality; understand measurement of hydrogen ion concentration.
- Identify laboratory apparatus and instruments; demonstrate the use of chemical balance.
- Perform preparation of chemical solutions; calculate molecular weights and equivalent weights of compounds.
- Prepare normal, molar, and percent solutions; prepare reagents and apply dilution techniques.
- Demonstrate proper cleaning, handling, and maintenance of laboratory glassware and apparatus.

Basic Techniques and Biochemical Estimations

1. Laboratory Instruments and Techniques

- Explain the principle, types, and applications of centrifugation.
- Demonstrate the use of colorimeter, spectrophotometer, pH meter, and single pan balance.
- Analysis of arterial blood gases & electrolytes
- Explain the principle, types, and applications of electrophoresis.
- Fractionation & Identification of a)Amino acids b)Sugar c) Proteins d) Lipoproteins by
  - Thin Layer & Paper Chromatography.
  - Various diagnosis using HPLC
  - Gel electrophoresis & Paper Electrophoresis.
  - Capillary electrophoresis of Plasma proteins

2. Biochemical Estimations using Colorimeter / Spectrophotometer / Auto Analyzer

- Perform estimation of blood glucose and glucose tolerance test (GTT); demonstrate glucometer use and interpret results.
- Estimate blood urea and calculate BUN; interpret in clinical conditions.
- Estimate serum creatinine and calculate creatinine clearance; interpret in renal disorders.
- Estimate serum uric acid and interpret its clinical relevance.
- Perform liver function tests: bilirubin (total, direct, indirect), SGOT, SGPT, ALP, total protein, albumin; calculate A:G ratio and interpret.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

- Estimate lipid profile: total cholesterol, triglycerides, HDL (direct); interpret in cardiovascular risk.
- Estimate serum electrolytes: sodium, potassium, chloride, calcium, magnesium; interpret in fluid and electrolyte imbalance.
- Estimate serum amylase and lipase; interpret in pancreatic disorders.
- Perform estimation of cardiac enzymes and interpret in cardiac conditions.
- Describe various body fluids and discuss the composition and clinical significance of cerebrospinal fluid (CSF).

1. Endocrinology and Hormonal Assays

- Perform estimation of hormonal parameters using ELISA and Chemiluminescent analyzers:
  - Thyroid Profile: T3, T4, TSH
  - Gonadotropins: FSH, LH
  - Reproductive Hormones: hCG, Progesterone, Testosterone
  - Stress Hormones: Cortisol
- Interpret hormone levels in various endocrine disorders (e.g., hypothyroidism, infertility, Cushing's syndrome).

2. Tumor and Cancer Marker Estimation

- Perform estimation of tumor markers using appropriate methods:
  - Alpha-fetoprotein (AFP)
  - Carcinoembryonic antigen (CEA)
  - CA-125 and other cancer markers (e.g., PSA, CA 19-9)
- Interpret diagnostic and prognostic significance of tumor markers in oncology.

3. Instrumentation in Clinical Biochemistry

- Perform routine operations on semi-automated and fully automated analyzers.
- Understand loading of samples, reagent handling, and basic troubleshooting.
- Calibrate instruments and interpret generated data.

4. Quality Control in Clinical Laboratory

- Understand and apply Internal Quality Control (IQC) and External Quality Assurance (EQA) protocols.
- Calculation of coefficient of variation, coefficient of correlation, plotting LJ charts.
- Total Quality Management of Laboratory:
  - Specimen collection, handling & storage of sample.
  - Methods of standardization & calibration.
  - Methods of quality control & assessment.

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

5. Clinical Interpretation of Biochemical Tests Observe, interpret, and discuss baseline, diagnostic, prognostic, and discharge laboratory investigations in the following conditions:

A. Metabolic & Endocrine Disorders

- Diabetes mellitus
- Obesity
- Dyslipidaemia
- Thyroid disorders
- Genetic and inborn errors of metabolism
- Nutritional and vitamin deficiency disorders

B. Hepatic & Gastrointestinal Disorders

- Jaundice
- Liver diseases (e.g., hepatitis, cirrhosis)
- Fatty liver
- Pancreatitis

C. Cardiovascular Disorders

- Myocardial infarction

D. Renal and Urological Disorders

- Renal failure
- Nephrotic syndrome
- Gout

E. Electrolyte and Acid-Base Balance Disorders

- Disorders of electrolyte metabolism (Na^+, K^+, Cl^-, Ca^{2+}, Mg^{2+})
- Disorders of acid-base balance
- Disorders of mineral metabolism (e.g., phosphate, calcium imbalance)

Dissertation.

Pedagogy

Identifying several situations same and able to dissertation work, writing a proposal and making a presentation to the Dissertation faculty advisory committee. Reporting to the committee on the progress of research work periodically. Making use of a variety of research methods. Defending the inference before the Examining Committee.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Contents

Every student will do a detailed study on the topic selected for the dissertation, and is expected to prepare a two or three proposals which he intends to take up for the Dissertation. Faculty will examine this and decide on the topic of dissertation.

The Process involves:

1. Formulation of objectives and hypothesis
2. Review of literature
3. Designing the tool for data collection
4. Data collection
5. Coding, classifying and analysis of data
6. Inferences, conclusions and recommendations
7. Preparing a bibliography
8. Writing the dissertation and submission

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S101T
MSCM0223S101T
MSCM0323S101T
MSCM0423S101T
MSCM0523S101T

MODEL PAPER

M. Sc. (Medical)
Physiology/Pharmacology/Microbiology/
Biochemistry/Anatomy
Semester I
Examination (Month/ year)

Paper - I

Anatomy

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15 = 30**

Q1. Describe Synovial joints under following headings: (2.5+10+2.5)
(i) Components and Structure of joint
(ii) Classification of synovial joint
(iii) Factors providing stability to joint.

Q2. Describe central nervous system under the following headings: (10+2.5+2.5)
(i) Parts and their functions
(ii) Cells present in CNS
(iii) Functions of cerebellum

Q3. Classify bones with examples and describe blood supply of long bone (10+5)

2. Short Essay (Attempt any two) **2x15=30**

A. Describe Compact and cancellous bones with examples
B. Components of respiratory system with functions.
C. Parts of female reproductive system with functions.

3. Write short notes on: (Any Four) **20 (5x4)**
(A) Types of cartilages
(B) Compare functions of sympathetic and Parasympathetic nervous system
(C) Contribution of A. Vesalius in study of anatomy
(D) Types of anastomosis between blood vessels
(E) Types of muscles with examples.

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S102T
MSCM0223S102T
MSCM0323S102T
MSCM0423S102T
MSCM0523S102T

MODEL PAPER

M. Sc. (Medical)
Physiology/Pharmacology/Microbiology/
Biochemistry/Anatomy
Semester I
Examination (Month/ year)

Paper - II

Physiology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

1. Describe Classification of Reflexes & Describe in detail Stretch Reflex

2. Define erythropoiesis. List the different stages of erythropoiesis. Describe factors necessary for erythropoiesis

3.Define cardiac output, how is it regulated? Give one method of measurement of cardiac output.

2. Short Answer Questions (Attempt any two): **10X2=20**

1. Homeostasis
2. Functions of Cerebellum
3. Oxygen hemoglobin dissociation curve.

3. Short Notes (Any four) **5X4=20**

1. Reninangiotensin system.
2. Blood Brain Barrier
3. Actions of parathormone.
4. Acommodation reflex
5. Spermatogenesis

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S103T
MSCM0223S103T
MSCM0323S103T
MSCM0423S103T
MSCM0523S103T

MODEL PAPER

M. Sc. (Medical)
Physiology/Pharmacology/Microbiology/
Biochemistry/Anatomy
Semester I
Examination (Month/ year)

Paper - III

Biochemistry

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. With the help of flow chart describe in detail about Glycolysis. Write its energetics
B. Explain all the reactions of Urea Cycle. Add a note on Ammonia toxicity
C. Enumerate Beta-oxidation with the help of flow chart. Also write the energetics of Palmatic acid.

1. **Short Essay (Attempt any 2)** **2x10=20**

A. Classification of Carbohydrate
B. Write the biochemical function, RDA and deficiency disorders of Vitamin A
C. Factors affecting enzyme activity

2. **Short notes (Attempt any 4)** **4x5=20**
A. Calcium Homeostatis
B. Chromatography
C. Functions of Mitochondria
D. Structure of DNA
E. Thyroid Function Test

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S104T

M. Sc. (Medical)

Semester I
Examination (Month/ year)

Paper - IV

Health care Services and its Application

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

- Enumerate the steps involved in administration of care plan. Explain the risk factors of hospital acquired infections and how it can be controlled?
- Suppose a person has met with an accident. What kind of services of priority should be followed by the first aider in an emergency?
- What is the concept, definition and dimension of wellbeing? What are the determinants of good health?

2. Short Essay (Attempt any Two) **2X10 = 20**

A. Write short notes on – National Health Policies-Public Health Systems-Current trends in private healthcare

B. Write a detailed note on World Health Organization.

C. What are the relevant contemporary issues in health services which need to be addressed without delay? Explain your answer with specific example.

3. Short notes (Any four) **4X5 = 20**

A. Write short notes on – National Health Policies-Public Health Systems-Current trends in private healthcare.

B. Write about national oral health program.

C. Briefly explain healthcare models

D. Illustrate the glimpses of NHP-2017

E. What are the theories of diseases?

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S105T

M. Sc. (Medical)
Biochemistry
Semester I
Examination (Month/ year)

Paper - V

Basics of Computer

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Discuss about Memory

B. Discuss about input / Output Devices.

C What do you understand about Magnetic ink character recognition (MICR).

2. Short Essay (Attempt any Two) **2X10 = 20**

A. Optical mark recognition (OMR).
B. Bar code reader.
C. Computer software

3. Short notes (Any four) **4X5 = 20**

A. Monitor.
B. Word processing software.
C. Definition of Machine language.
D. Compiler & Interpreter
E. Interpreter.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S106T

M. Sc. (Medical)
Biochemistry
Semester I
Examination (Month/ year)

Paper - VI

Basic of Health care IT

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Emerging technology issues in healthcare.
B. Concepts and operation of the main components of word processor.
C. Electronic spreadsheet

2. Short Essay (Attempt any Two) **2X10 = 20**

A. Conceptual and relational data modeling.
B. Data integrity.
C. Relational normalization theory

3. Short notes (Any four) **4X5 = 20**

A. Database systems
B Health Statistics
C. Billing softwares.
D Models of health care delivery.
E. Presentation software programs.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S201T
MSCM0223S201T
MSCM0323S201T
MSCM0423S201T
MSCM0523S201T

MODEL PAPER

M. Sc. (Medical)
Physiology/Pharmacology/Microbiology/
Biochemistry/Anatomy
Semester II
Examination (Month/ year)

Paper - I

Pathology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

   A. Describe anemia with its classification. Discuss in detail about Sickle cell Anemia.

   B. Describe and Define cell injury along with its Causes. Write in detail about Reversible and irreversible injury.

   C. Define neoplasia along with its nomenclature. Write in brief about carcinogenesis and metastasis.

2. **Short Essay (Attempt any two)** 2x10=20

   A. Factors affecting wound healing

   B. Difference between Acute and Chronic inflammation

   C. Difference between benign and malignant neoplasm

3. **Short notes (Any four)** 4x5=20

   A. Renal Function Test

   B. Liver Function Test

   C. Pancreatic Function Test

   D. Lab investigation of haemorrhagic disorders

   E. Discuss Diabetes Mallitus

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S202T
MSCM0223S202T
MSCM0323S202T
MSCM0423S202T
MSCM0523S202T

MODEL PAPER

M. Sc. (Medical)
Physiology/Pharmacology/Microbiology/
Biochemistry/Anatomy Semester II
Examination (Month/ year)

Paper - II

Microbiology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

Q1. Define Sterlization. How does it differ from disinfection? Classify the various agents used in sterilization. Add a note on the principle and functioning of autoclave. Components and Structure of joint (ii) Classification of synovial joint (iii) Factors providing stability to joint.

Q2. Name the various methods of gene transfer. Discuss any one of these in detail.

Q3. Describe in detail the structure and function of the cell wall and cell membrane of a gram-negative rod with the help of a diagram.

2. Short Essay (Attempt any two) **2x15=30**

A. Dark field microscope
B. Bacterial growth curve
C. Loffier's srum slope

3. Write short notes on: (Any Four) **20 (5x4)**

(A) Lawa culture
(B) Transduction
(C) Nutrient agar
(D) Biologic safety cabinets
(E) Standard Precautions

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S203T

M. Sc. (Medical)
Biochemistry
Semester II
Examination (Month/ year)

Paper - III

Basic Instrumentation & Lab Practices

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Describe in detail about the Biomedical Waste Management as per the guidelines.
B. Define pH. Enumerate the important blood buffer. Explain Henderson-Hasselbalch equation.
C. Explain in detail working principle of Laminar Air Flow chamber. Enumerate its types and applications of Laminar Air Flow.

1. Short Essay (Attempt any 2) **2x10=20**

A. Types of Glassware used in Laboratory
B. Principle and applications of Centrifuge
C. Material safety data sheet

2. **Short notes (Attempt any 4)** **4x5=20**

A. Steps of Hand Wash
B. Use of PPEs
C. Types of Vacutainers
D. Molality & Molarity
E. Indicators

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S204T

M. Sc. (Medical)
Biochemistry
Semester II
Examination (Month/ year)

Paper – IV

Internet Technology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Discuss about Internet Technolo gy application in health care sector.

B. Discuss healthcare Information Technology.

C. Discuss Issues in Internet Technology.

2. Short Essay (Attempt any Two) **2X10 = 20**

A. What are Internet tools?
B. What are Internet networks?
C. Discuss access to Internet in hospital.

3. Short notes (Any four) **4X5 = 20**

A. Informatics officer roles and responsibilities

B. IT and Computer

C. Communication

D. Models of health care delivery

E. Information Technology and Systems.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S205T

M. Sc. (Medical)
Biochemistry
Semester II
Examination (Month/ year)

Paper - V

Genetic Engineering

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

Discuss about Basic concepts of DNA structure
B. Define enzymes
C. What Radioactive and non-radioactive probes ?

Q. No. 2 Short Essay (Attempt any Two) **2X10 = 20**
A. What is Isolation of total RNA and mRNA?
B. Write down about Bacteriophages
C. What is Plasmids?

Q. No. 3 Short notes (Any four) **4X5 = 20**
A. cDNA
B. Introduction of DNA into mammalian cells
C. Real time PCR
D. Types of PCR multiplex and describe each.
E. Differential gene expression methods

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S206T

M. Sc. (Medical)
Biochemistry
Semester II
Examination (Month/ year)

Paper - VI

Organizational Behaviour

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Discuss about organizational Behaviour
B. Discuss about Organizational policies.
C. Utilization management.

2. Short Essay (Attempt any Two) **2X10 = 20**
A. Professionalism.
B. International Standards Organization.
C. Hospital organizations

3. Short notes (Any four) **4X5 = 20**
A. Types of hospitals.
B. Health Statistics
C. Billing assessment of population health.
D. Healthcare Industry.
E. Information Technology in quality.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S301T

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - I

Chemistry & Metabolism of Proteins & Lipids

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Write the reactions by which Glycine is synthesized and catabolised. Enumerate any 4 important compounds derived from Glycine and indicate their functions.

B) Enumerate the major steps of synthesis of Cholesterol. Name the rate limiting step of cholesterol synthesis. Describe the role of cholesterol in atherosclerosis.

C) What are ketone bodies. Give two conditions characterised by excessive production of ketone bodies. Explain the metabolic derangements and consequences of ketosis

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) How are Prostaglandins synthesized? Indicate their importance as local hormones.

B) Describe the reactions of the Urea Cycle. Discuss the interrelation of urea cycle and citric acid cycle.

C) Describe the steps of catabolism of phenylalanine and tyrosine. Indicate the inborn errors of metabolism associated with this pathway.

3. Short notes (Any four) **4 x 5 = 20**

A) Biological importance of peptides

B) One carbon metabolism

C) Ammonia toxicity

D) Effect of Insulin on Lipolysis

E) Role chaperones in folding

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S302T

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - II

Chemistry & Metabolism of Carbohydrates & Nucleotides

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Discuss the formation of acetyl-CoA from pyruvate. How is acetyl-coA further metabolized in the citric acid cycle.

B) Give the sources of carbon and nitrogen atoms of purine and pyrimidine rings. How is the denove synthesis regulated? Indicate the clinical uses of inhibitors of purine nucleotide synthesis.

C) "Gluconeogenesis is not a simple reversal of glycolysis" Justify the statement by explaining the pathway of gluconeogenesis.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Lesch-Nyhan syndrome: enzyme defect, clinical features, inheritance and treatment

B) Discuss the changes in metabolism during diabetes mellitus.

C) In anaerobic glycolysis, lactic acid is generated. What is the reason for reduction of pyruvate to lactate.

3. Short notes (Any four) **4 x 5 = 20**

A) Gout

B) Significance of HMP Shunt

C) Galactosemia

D) Transport mechanism of glucose

E) Differences between DNA & RNA

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

Paper Code
MSCM0123S303T
MSCM0223S303T
MSCM0323S303T
MSCM0423S303T
MSCM0523S303T

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - III

Biostatistics & Research Methodology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

Q. 1. Long Answer (Attempt any two) **2X15=30**

A. Introduction to research methodology.
B. Discuss about the biostatistics
C. Describe Types of variables & scales of measurements.

Q. 2 Short Essay (Attempt any Two) **2X10 = 20**

A. Concept of probability distribution
B. Basics of Testing of Hypothesis
C. Describe Correlation & Regression

Q. 3 Short notes (Any four) **4X5 = 20**

A. Cluster randomization.
B. Sampling & Non sampling errors
C. Incidence & Prevalence
D. Random & non- random sampling
E. Methods of minimizing errors.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S304T

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - IV

Legal and Medical Issues in Hospitals

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

Q. 1. Long Answer (Attempt any two) **2X15=30**

A. What are the laws with regard to the establishment of private / public hospitals? What are the legal requirements under Medical Establishment Act?

B. What are the essentials of contract act? What are the contractual obligations in hospital services? Explain

C. Explain the rule governing Prohibition of Violence against medical personnel and damage to property?

Q. 2 Short Essay (Attempt any Two) **2X10 = 20**

A. What are the legal liabilities of a hospital under the consumer protection law? What are the legal remedies available to the patient under consumer law?

B. What are medical ethics? What are the basic issues and the importance of developing medical ethics?

C. Provisions for registered practitioners under Medical Termination of Pregnancy Act

Q. 3 Short notes (Any four) **4X5 = 20**

A. Vicarious liability.

B. Drugs and Cosmetics Act

C. Hippocratic Oath

D. Ethical guidelines for Bio-medical research

E. Medical Negligence

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S305T

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - V

Patient Care Management

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. What is meant by patient classification? Explain the various patients of patient classification systems?

B. What are different types of natural disasters? Explain in detail.

C. Disaster impacts differential groups at various levels. Justify.

Q. 2 Short Essay (Attempt any Two) **2X10 = 20**

A. Write short notes on –Medical Records-Legality of medical records-DRG- HBG

B. Time taken for discharge procedure has a greater impact in providing patient centric services discuss?

C. A hospital should take due care with regard to patient care safety and risk to them? Do you agree with this statement? Elaborate.

Q. 3 Short notes (Any four) **4X5 = 20**

A. What are the dimensions of patient safety culture?

B. What are the calibers for patient satisfaction?

C. Write about the concept of patient empowerment.

D. What is the importance of consent form before nuclear medicine treatment?

E. Patient care management and housekeeping- how will you connect the points?

Professor and Head
Dept. of Biochemistry,
M G Medical College
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S306T

M. Sc. (Medical)
Biochemistry
Semester III
Examination (Month/ year)

Paper - VI

Sports Nutrition

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Explain in detail difference between sports nutrition and nutrition for exercise
B. Describe about bioenergetics for physical activity
C. What is the different between medical nutrition therapy for endurance sports and strength sports?

Q. No. 2 Short Essay (Attempt any 2) **2 x 10 = 20**

A. Describe in detail about pre event and post event meals
B. Describe the effect of caffeine on sports performance.
C. Role of hormones in exercise.

Q. No. 3 Short Notes (Attempt any 4) **4 x 5 = 20**

A. How muscles use carbohydrates during exercise.
B. What is the process of blood glucose maintenance during exercise?
C. Describe carbohydrate, protein & fat metabolism before exercise.
D. Describe muscle fibers.
E. What is ACTH & how it works during exercise?

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S401T

M. Sc. (Medical)
Biochemistry
Semester IV
Examination (Month/ year)

Paper - I

Bioenergetics & Intermediary Metabolism

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Write the components of the Electron Transport Chain, in the order of redox potentials, and show the steps where ATP is synthesised.
B) Discuss the amphibolic role of TCA cycle in the integration of metabolism. Highlight the sources and utilization of acetyl-coA and explain the physiological regulation of TCA cycle.
C) Explain the law's of thermodynamics and write a note on Gibb's free energy.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Discuss Chemiosmotic hypothesis to explain ATP biosynthesis by oxidative phosphorylation
B) Explain how thermodynamically unfavourable reactions occur in our body.
C) Explain metabolism during fasting and Fed state

3. Short notes (Any four) **4 x 5 = 20**

A) Inhibitors of ETC
B) Energy rich compounds
C) Biochemical effect of glucagon
D) Uncouplers of oxidative phosphorylation
E) Gluco-regulatory system

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MSCM0223S402T

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester IV
Examination (Month/ year)

Paper - II

Enzmology

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Enumerate the major classes of enzymes, explain the factors affecting the velocity of an enzyme reaction.
B) Name the types of enzyme inhibition. explain various types of inhibition with it's examples.
C) "Vitamins as cofactors" justify the statement.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Enzymes used in the diagnosis of hepatic disease.
B) Explain the properties and mechanism action of enzymes.
C) Lab diagnosis of myocardial infarction

3. Short notes (Any four) **4 x 5 = 20**

A) Active site
B) Allosteric regulation of enzymes
C) Isoenzymes and their diagnostic importance
D) Multiple enzyme complex
E) Enzyme cascade in Blood clotting mechanism

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S403T

M. Sc. (Medical)
Biochemistry
Semester IV
Examination (Month/ year)

Paper - III

Nutritional Biochemistry

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Describe the types, causes, clinical features and management of protein energy malnutrition.
B) Enumerate the dietary sources, biochemical function, RDA and deficiency manifestations of Vitamin-D.
C) Describe the biochemical functions, absorption, transport and storage of Iron. Write a short note on its deficiency manifestations.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) What are the proximate principles of food and explain the importance of dietary fibers.
B) Diet chart in Pregnancy and lactation
C) Biochemical functions and deficiency manifestations of Ascorbic acid.

3. Short notes (Any four) **4 x 5 = 20**

A) Wald's visual cycle
B) Balance diet
C) Eating disorders
D) Wilson's disorder
E) Calcium homeostasis

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S404T

M. Sc. (Medical)
Biochemistry
Semester IV
Examination (Month/ year)

Paper - IV

Hospital Information System

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. What do you understand by Management Information System? Explain the concept, roles and objectives of MIS with relevance to a hospital.

B. Comment upon physical designs system? Explain the programme and procedure development with regard to input output design?

C. Explain the relevance of hospital information system in hospitals? Substantiate your answer by taking four departments and explaining in detail?

2 Short Essay (Attempt any Two) **2X10 = 20**

A. What is project life cycle? Explain the procedure of its installation and operation.

B. Explain the role of MIS in surveillance of healthcare systems. Elaborate your answer with the help of an example of a hospital.

C. What factors have prompted in the development, implementation and evaluation of MIS systems? Has it been able to serve the requisite purpose till date? Comment

Q. 3 Short notes (Any four) **4X5 = 20**

A. Illustrate the hacks and drawbacks in HIS.

B. Explain digitized ADT system.

C. Write about DSS- Decision support system.

D. COPI- Computerized Physician Order entry- Explain.

E. Describe the computerized appointment scheduling system in hospital

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S405T

M. Sc. (Medical)
Biochemistry
Semester IV
Examination (Month/ year)

Paper - V

Constitution of India

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. "Powers of the Parliament to amend the Constitution is wide but not unlimited". Explain this statement.

B. Describe the powers and functions of the Supreme Court of India?

C. Describe the composition and functions of the Union Public Service Commission.

Q. 2 Short Essay (Attempt any Two) **2X10 = 20**

A. Discuss in brief the various writs that can be issued by a High Court in India. Explain the privileges and immunities of Parliament and its members.

B. What are the emergency provisions relating to the failure of the constitutional? Machinery in the states ?

C. Discuss in brief the various writs that can be issued by a High Court in India. Explain the privileges and immunities of Parliament and its members.

Q.3 Short notes (Any four) **4X5 = 20**

A. What are fundamental rights of a citizen of India?

B. Explain the steps involved in amending the Constitution, in India?

C. Briefly touch upon the functioning of Public Service Commissions of states?

D. Discuss in brief the collective responsibility of the Council of Ministers.

E. Write a brief note on Election Commission with regard to its functioning and powers?

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester IV

MSCM0223S406T

Fourth Semester

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

Examination (Month/ year)

Paper - **VI**

Environment and Ecology

Time: Three **Hours**

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. What is climate change? Discuss the causes and consequences of climate change.
B. Brief outline the environment (protection) act of 1986. Explain the importance of environment protection act with relevance to hospital administration.
C. What is the relevance of environment and ecology? Explain the same with relevance to hospital administrators.

2. Short Essay (Attempt any Two) **2X10 = 20**

A. What is air pollution? Explain the factors and sources responsible for causing air pollution in hospitals.
B. Explain water pollution and measures to control water pollution. What is the relevance of sewerage treatment plant?
C. What is Noise pollution? What are the sources, effects and control standards for noise pollution?

2. Short notes (Any four) **4X5 = 20**

A. Write about pollution controlling certification in hospitals.
B. What is Ecological balance. What are the consequences of change in ecological balance?
C. State the colors of dustbins used in hospital waste process and explain.
D. How noise pollution can be controlled?
E. What is greenhouse effect?

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

MSCM0223S501T

M. Sc. (**Medical**)
Biochemistry
Semester V
Examination (Month/ year)

Paper - I

Biochemical Techniques

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Write a note biological effect of cellular oxidants. Describe the cellular process where oxidants species are generated.

B) Explain the Principle, types, instrumentation and applications of Chromatography.

C) What are isotopes and write the diagnostic and therapeutic role of radio isotopes.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Types and Applications of ELISA

B) RIA

C) Principle, types and applications of Centrifugation

3. Short notes (Any four) **4 x 5 = 20**

A) Antioxidants

B) Mass spectroscopy

C) Immunodiffusion

D) Beer's & Lambert's law

E) Oxidative stress

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester V

MSCM0223S502T

Fifth Semester

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

Examination (**Month/ year**)

Paper - **II**

Clinical Biochemistry **I**

Time: Three **Hours**

Maximum **Marks: 70**

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Give an account of the serum enzymes derived from the Liver & their importance in Liver Function Test and describe the biochemical parameters for the differential diagnosis of jaundice.

B) Outline the pathway of heme synthesis. Mention its regulation. Correlate the features of porphyria's with regulation of heme synthesis.

C) Explain the chemistry, composition and functions of CSF and its diagnostic use in various disorders.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Thyroid Function Test

B) Explain the phases of xenobiotic, metabolism with details of glucuronidation.

C) Define diabetes mellitus. Write its type, symptoms, diagnosis and complications of diabetes mellitus.

3. Short notes (Any four) **4 x 5 = 20**

A) Lead poising

B) Biochemical changes in Ageing

C) Atherosclerosis

D) Clearance Test

E) Structure and synthesis of Collagen

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester V

MSCM0223S503T

Fifth Semester

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

Examination (**Month/ year**)

Paper - **III**

Immunology

Time: Three **Hours**

Maximum **Marks: 70**

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) What are carcinogens and explain etiological factors and pathophysiology of cancer. Write a note on oncogenes.
B) List the various techniques used in recombinant DNA technology. describe any two in detail.
C) What do you mean by immune response? what are different effector mechanism found in our body? Add a note on bence jones proteins?

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Explain the types of complement activation pathway with their regulation.
B) Explain the types. structure and functions of MHC complex.
C) Enumerate different Immunoglobulins. Describe the structure of Immunoglobulins and compare the salient Features of different classes of Immunoglobulins.

3. Short notes (Any four) **4 x 5 = 20**

A) Applications of hybridoma technology.
B) Types of hypersensitivity reactions
C) Antibody Diversity
D) Tumor markers
E) AIDS

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester V

MSCM0223S504T

Fifth Semester

M. Sc. (Medical) Biochemistry

Examination (Month/ year)

Paper - **IV**

Artificial Intelligence and Machine Learning

Time: Three **Hours**

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Introduction to Artificial Neural Networks
B. Describe Models of a Neuron.
C. Discuss Computer vision .

2. Short Essay (Attempt any Two) **2X10 = 20**
A. Describe Machine Learning.
B Recurrent Networks
C What is Boltzman, Supervised and unsupervised learning?

3. Short notes (Any four) **4X5 = 20**
A. Network architectures
B. Boltzmann machine
C. What is Temporal processing?
D. Recurrent neural networks.
E. Deep Learning

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester V

MSCM0223S505T

Fifth Semester

M. Sc. (Medical) Biochemistry

Examination (Month/ year)

Paper - **V**

Hospital Organization and Management

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Discuss about **Management.**
B. Evolution of management thought.
C. Nature of Management process.

2. Short Essay (Attempt any Two) **2X10 = 20**
A. What is accounting information?
B . What is Third Party Administrator?
C. Discuss access and quality of care issues.

3. Short notes (Any four) **4X5 = 20**
A Decision Making
B Steps in planning.
C Delegation of Authority Staffing.
D. Models of health care delivery.
E Information Technology and Systems.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester V

MSCM0223S506T

Fifth Semester

M. Sc. (Medical) Biochemistry

Examination (Month/ year)

Paper - **VI**

Hospital Equipment Management

Time: Three **Hours**

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. What are the guidelines for selection of medical equipment for the hospital?

B. Describe the methods of medical equipment maintenance in the hospital.

C. What are the factors to be considered before installing and commissioning of biomedical equipment?

2. Short Essay (Attempt any Two) **2X10 = 20**

A. Medico-legal issues related to hospital equipment
What is buy-back and replacement policy in Equipment management. Enumerate advantages and disadvantages

3. Short notes (Any four) **4X5 = 20**

A. Importance of International and Indigenous standards of Equipment

B. Maintenance and monitoring of biomedical equipment in hospital

C. Steps in planning to buy a medical equipment

D. Break-Even Analysis

E. Procedures for condemnation and disposable of medical equipment

F. Letter of Credit

G. Hospital need assessment

H. Prevention of hazards

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester VI

MSCM0223S601T

Sixth Semester

M. Sc. (Medical) Biochemistry

Examination (Month/ year)

Paper - **I**

Molecular **Biology**

Time: Three **Hours**

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Describe the phase of activation, initiation, elongation and termination of biosynthesis of protein.

B) Discuss in detail the Lac operon and the molecular switch of prokaryotic genes.

C) Explain the DNA repair mechanism with a note on the associated diseases.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) What is mutation? What are mutagens? Describe point mutation and frame shift mutation.

B) How is the DNA molecule cloned? Write two applications of DNA cloning.

C) Enumerate the process of PCR technique with its clinical applications.

3. Short notes (Any four) **4 x 5 = 20**

A) Chromosome walking

B) Genetic Code

C) Next Generation Sequencing

D) Post transcriptional modifications

E) Human Genome Project

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester VI

MSCM0223S602T

Examination (Month/ year)

Paper - II

Clinical Biochemistry II

Time: **Three Hours**

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) Define anemia. Write the etiological & morphological classification of anemia and laboratory diagnosis.

B) Enumerate hemoglobinopathies and describe any two in detail.

C) Define and classify hormones and explain the mechanism of action of steroid hormone.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Discuss any 2 inborn errors of Metabolism of aromatic amino acids

B) What is cyclic AMP? What is its metabolic importance.

C) Glycogen storage diseases.

3. Short notes (Any four) **4 x 5 = 20**

A) Biological effect of glucocorticoids

B) Functions of adrenal gland

C) Glycoprotein hormones

D) Oncogenes

E) Fabry's disease

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical) Biochemistry Semester VI

MSCM0223S603T

Sixth Semester

M. Sc. (Medical) Biochemistry

Examination (Month/ year)

Paper - III

Recent Advances & Quality Assurance

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary copy along with one main answer book is allowed.

1. Long Answer (Attempt any two) **2 x 15 = 30**

A) What is IQC? What are the basic steps followed in IQC.

B) Describe the quality assurance along with the description of quality policy, precision and accuracy.

C) What is Automation? Describe its Principle and explain standard operating procedures including calibration.

2. Short Essay (Attempt any Two) **2 x 10 = 20**

A) Describe in detail west guard rules with the help of LJ charts.

B) Describe types of errors in laboratory. Describe different types of methods to remove these errors.

C) Principle & advantages of Dry chemistry.

3. Short notes (Any four) **4 x 5 = 20**

A) Corrective action and Preventive action

B) Biochips

C) Chemiluminescent analyzers

D) EQAS

E) ISO certificate

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester VI

MSCM0223S604T

Examination (Month/ year)

Paper - IV

Biomedical Waste Management

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Name the different types of biomedical waste generated in your hospital. Suggest measures for their disposal as per National and State Level rules
B. Colour coding for disposal of biomedical waste is necessary - Justify. Explain in brief the methods of biomedical waste management in a Medical college and Hospital.
C. What are the various methods of treatment and disposal technologies for health care waste?

2. Short Essay (Attempt any Two) **2X10 = 20**

A. Principles of Biomedical Waste management.
B. How biomedical waste is categorized? How is category No. 3 disposed?
C. EXPLAIN WHY Biomedical waste should be segregated at source.

3. Short notes (Any four) **4X5 = 20**

A. Disposal of sharp wastes in hospital setting.

B. Injection safety

C. Hospital waste disposal.
D. Write the different containers and their colours for disposing the hospital wastes
E. Disposal of sharp wastes in hospital setting

for

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester VI

MSCM0223S605T

Examination (Month/ year)

Paper – V

Teaching Methodology
Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

1 Enumerate various teaching learning methods for large group settings. Discuss their advantages and disadvantages.

2 Enlist the various models of feedback mechanism. Describe any one in detail along with its advantages.

3 What are the components of a Lesson plan. Prepare a lesson plan for topic of psychomotor domain.

Q. No. 2 Short Essay (Attempt any 2) **2 x 10 = 20**

a) Stages of group dynamics
b) Teaching strategies for affective domain
c) Significance of defining learning objectives

Q. No. 3 Short Notes (Attempt any 4) **4 x 5 = 20**

a) Formative assessment
b) Qualities of a good mentor
c) Progression of learning
d) Assessment tools for practical skills
e) e-learning

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR

MODEL PAPER

M. Sc. (Medical)
Biochemistry
Semester VI

MSCM0223S606T

Examination (Month/ year)

Paper - VI

Basic Life Support (BLS)

Time: Three Hours

Maximum Marks: 70

Attempt all Questions

All the parts of one question should be answered at one place.

Only one Supplementary Copy along with one main answer book is allowed

1. **Long Answer (Attempt any two)** **2X15=30**

A. Describe basic life support for adults with diagrams.
B. Describe basic life support for infants and children.
C. What is defibrillator? Explain in detail.

Q. No. 2 Short Essay (Attempt any 2) **2 x 10 = 20**
A. Make a flow chart for compression only life support algorythm.
B. What is cardiac arrest?
C. What is respiratory arrest?

Q. No. 3 Short Notes (Attempt any 4) **4 x 5 = 20**
A. IHCA
B. OHCA
C. Explain about pediatric chain of survival
D. Management of choking
E. Explain role of team leader.

Professor and Head
Dept. of Biochemistry,
M G Medical College,
Sitapura, JAIPUR