



**MAHATMA GANDHI UNIVERSITY**  
*of*  
**MEDICAL SCIENCES & TECHNOLOGY**  
JAIPUR

# Syllabus

**M.Sc. (Medical) MICROBIOLOGY**

**(3 Years Degree Course)**

## Notice

1. Amendment made by the Board of the Management of University in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.
2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

**RULES & REGULATIONS**  
**M.Sc. (Medical) MICROBIOLOGY**

**ELIGIBILITY FOR ADMISSION:**

For admission a candidate should have passed qualifying examination as under :

1. B.Sc. (with at least one subject of Biological sciences) / MBBS / B.D.S. / B.A.M.S. / B.H.M.S. / B.P.T. / B.O.T / B.Pharma / B.Sc. Nursing / B.Sc. Biotech. / B.V.Sc. and A.H. from a recognized University / Institution. B.Sc. graduate with Physics and Chemistry as optional subjects could be considered for M.Sc. Biochemistry.
2. Minimum 50% marks in the qualifying examination are required for consideration for admission.

**DURATION OF COURSE:**

1. The period of training for M.Sc. (Med.) course shall be of 3 years from the date of registration.
2. M.Sc.(Med.) Part-I shall be of 1 year duration.
3. M.Sc.(Med.) Part II of 2 year duration from the date of passing M.Sc.(Med.) Part-I Examination.
4. Only those candidates will be allowed to appear at M.Sc.(Med.) Pt. II examination, who have passed M.Sc.(Med.) Pt. I examination completely.
5. The students who have been registered late in the Medical College will not be allowed to appear in the regular examination and they will be required to complete the period of study prescribed and fulfill the requirement of attendance.
6. The candidate will undertake the Post-graduate training as a full time post graduate in the department concerned or as an in service trainee in the discipline concerned. The candidate after passing M.Sc. (Med.) Pt. I Examination shall also be required to participate in the Under-graduate training in his subject. The Head of the Department concerned shall certify that the student has been regular and undergone training programme according to the requirements.

**ATTENDANCE:**

1. The M.Sc.(Med.) Part-I & Part-II Course will have compulsory 75% attendance in theory and practical separately in the opted branch.

A candidate lacking the prescribed attendance and progress in any theory and/or practical paper shall not be permitted to appear in the examination.

**M.Sc. (Medical) Microbiology Part-I**

**EXAMINATION AND ASSESSMENT**

The examination in M.Sc. (Med.) Part I shall consist of Theory papers only.

**(1) Theory**

- (a) Each theory paper shall be of 3 hours
- (b) Paper I of all branches shall consist of 3 sections viz. A, B and C (Anatomy, Physiology, Biochemistry). Each section will consist of 3 questions out of which the candidate will have to attempt 2 questions. Each section will be of 25 marks.
- (c) Paper II of Anatomy, Physiology and Pharmacology shall consist of three sections viz. A, B and C of subjects Pharmacology, Pathology and Microbiology, each of 25 marks (Total-75 marks). In case of Biochemistry and Microbiology, paper II shall consist of two sections viz. A and B of subjects Pathology and Microbiology, each of 38 and 37 marks respectively (Total 75 marks).
- (d) Each section will be answered in separate answer books.

- (e) A common paper shall be set by the external examiner of respective branches for Paper I, which shall be used in all branches. A common paper shall be set by external examiner for Paper II of Anatomy, Pharmacology and Physiology and a separate paper for Paper II of Biochemistry and Microbiology. The answer copies shall be evaluated by the senior most Internal examiner.
- (f) In order to pass the examination, the candidate must secure a minimum of 50% marks in each paper.
- (g) A candidate who has failed in one or more paper of M.Sc. (Med.) Pt. I examination must appear in that failing paper in the Supplementary Examination which will be conducted by the University within 4-6 months.
- (h) A candidate shall be permitted a maximum of 4 attempts or for 2 years to complete the Part-I M.Sc. examination from the year of admission.

## **SCHEME OF EXAMINATION**

### **Anatomy**

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

### **Physiology**

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

### **Biochemistry**

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5030)	Pathology and Microbiology	75 marks

### **Pharmacology**

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5020)	Pathology, Microbiology and Pharmacology	75 marks

### **Microbiology**

Paper I (5010)	Anatomy, Physiology and Biochemistry	75 marks
Paper II (5030)	Pathology and Microbiology	75 marks

## **M.Sc. (Medical) MICROBIOLOGY PART II**

### **EXAMINATIONS:**

#### **1. Thesis**

- (a) Each candidate after passing M.Sc. (Med.) Pt. I Examination will submit plan for the thesis on the proposed subject through his Guide, Head of the Department and the Head of Institution shall forward it to the University for registration of the candidates so as to reach the Registrar's Office within six months from the date of his/her declaration of the result of M.Sc. Pt. I Examination. The thesis/ dissertation will be submitted to the University at least 4 months before the date fixed for the M.Sc. (Med.) Pt. II examination. In exceptional circumstances the thesis/ dissertation could also be accepted at least 3 months before the date fixed for the examination on the recommendation to that effect made by the guide and the Principal.
- (b) No candidate will be permitted to change the subject of his/her thesis/ dissertation without prior approval of the University.
- (c) The presentation of material in the thesis/dissertation should be precise and concise and the number of pages should not exceed 100. The thesis/ dissertation shall embody

the result of candidate's own work. This work shall include precise methods of investigations. He will be required to submit 4 type written copies of the thesis/ dissertation prepared under direction and guidance of the guide. Approval by the examiner of the thesis submitted by a candidate shall be pre-condition for his admission to the written Part of the M.Sc. (Med.) Pt. II Examination. The Thesis shall be evaluated by two external examiners and two internal examiners of the branch concerned. It will be deemed to have been approved, if it is approved by a majority of the examiners and, similarly, it will be deemed to have been rejected if it is not approved by a majority of the examiners. If two examiners approve the thesis and the other two reject it shall be referred to a fifth examiner (external) whose judgment shall be treated as final. In case the thesis submitted by a candidate is rejected, he shall be required to submit a fresh thesis/ dissertation.

- (d) A candidate who has submitted his/her thesis/ dissertation once and the same has duly been approved by the examiners, will not be required to submit a fresh one if he/she reappears for the examination in the same branch on a subsequent occasion. Thesis / Dissertation may also form the basis of the oral examination and due credit may be given for the same. The examiner may also inform the University about any outstanding thesis in a particular branch. The approved thesis or dissertation will be the property of the University.
- (e) If a candidate seeks admission to an examination in any other branch, he shall be required to submit a fresh thesis/ dissertation.

## 2. Theory

- (a) There will be three papers in all branches for M.Sc. (Med.) Part-II Examination, each of three hours duration.
- (b) All papers of the all branches will be set by the External Examiner.
- (c) Paper I and II will be assessed by the External Examiners who have set the question paper and whose question paper have been utilized in the examination and Paper III will be assessed by Internal Examiner viz Head of the Dept. of the Subject concerned.

## 3. Practical & Oral

There shall be a Practical & Oral examination in all branches conducted by Two Internal Examiners and Two External Examiners who will be appointed by the University.

1. Practical	200 Marks
2. Viva-voce	

## 4. Result

- (a) The candidate shall be required to secure at least 50% marks in theory papers and 50% marks in practical including viva-voce separately to pass the examination.
- (b) In case a student passes either in theory or in practical only, the student shall be considered to have failed in the whole examination and he will have to appear in both the theory and practical in the subsequent examination.
- (c) A candidate shall be permitted a maximum of 4 attempts or for 5 years to complete M.Sc. (Med.) Part-II from the date of initial admission in M.Sc. (Med.) Part I.
- (d) The provisional certificate and degree will be issued by the University after the candidate's having passed the theory & practical examination of M.Sc. Part II, along with approval of the Thesis/Dissertation.
- (e) No grace marks will be provided in M.Sc examinations. No Revaluation shall be permitted in the M.Sc examinations. However, the student can apply for scrutiny of the answer books.

**SCHEME OF EXAMINATION:**

Name of Paper	No. of Questions to be set	No. of Questions to be answered
Paper I	4	4
Paper II	4	4
Paper III	4	4

**Anatomy**

Paper I (5201)	- Human Gross Anatomy	100 Marks
Paper II (5202)	- Neuroanatomy, Microanatomy and History of Anatomy	100 Marks
Paper III (5203)	- Developmental Anatomy, Genetics, Recent Advances, Comparative Anatomy & Evolution	100 Marks

**Physiology**

Paper I (5241)	- Bio-Physics and Bio-Chemistry and Physiology (including) Histology of Muscles, Nervous, Circulation and Respiration.	100 Marks
Paper II (5242)	- Physiology (including Histology Except topics included in the first paper)	100 Marks
Paper III (5243)	- Comparative Animal Physiology and History of Physiology, Genetics and Principles of Biostatistics	100 Marks

**Bio-chemistry**

Paper I (5231)	- General Bio-Chemistry & Metabolism	100 Marks
Paper II (5232)	- Nutrition, Environmental & Clinical Biochemistry	100 Marks
Paper III (5233)	- Molecular Biology & Immunology, Biostatistics & Research methodology	100 Marks

**Pharmacology**

Paper I (5211)	- General Pharmacology, Systemic Pharmacology and Mechanism of Drug Action	100 Marks
Paper II (5212)	- Experimental Pharmacology, Bioassay and Biostatistics	100 Marks
Paper III (5213)	- Recent Advances, Biochemical Pharmacology and History	100 Marks

**Microbiology**

Paper I (5221)	- General Bacteriology and Immunology	100 Marks
Paper II (5222)	- Systematic Bacteriology and Clinical Microbiology	100 Marks
Paper III (5223)	- Virology, Mycology, Parasitology and Recent Advanced in Microbiology	100 Marks

**ANATOMY  
(For all Branches)**

**GENERAL 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, Skinappendages, 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

## **PHYSIOLOGY** **(For all Branches)**

### **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).

### **RESPIRATION:**

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

### **GASTROINTESTINAL TRACT:**

- (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)

**BIOCHEMISTRY**  
**(For all Branches)**

**BASICS OF BIOCHEMISTRY:**

- (1) Cell structure and function and transport through the biological membrane.
- (2) Chemistry of Biomolecules – carbohydrate, lipids, amino acids, proteins and nucleic acids.
- (3) Chemistry of Blood & Haemoglobin.
- (4) Enzymes – Nature and classification, concepts, Kinetic, mechanism of action.
- (5) Bioenergetics and Biological oxidation.
- (6) Metabolism of Carbohydrates, Proteins, Lipids and Nucleotides.
- (7) Integration of metabolism.
- (8) Nutrition, Vitamins & Minerals.
- (9) Detoxification & Xenobiotics.
- (10) Molecular Biology.
- (11) Organ function tests.
- (12) Immunology.
- (13) Analytical & Physical Biochemistry – Electrolytes, buffer systems, Law of mass action, viscosity, surface tension, osmosis, Donnan equilibrium, Dialysis, free energy, high energy linkages, molecular weight determination.
- (14) Principles, working & applications of : a) Colorimetry b) Spectrophotometry c) Flame Photometry d) Fluorometry e) Atomic absorption spectroscopy g) Ultra centrifugation.

## **MICROBIOLOGY** **(For all branches)**

### **GENERAL BACTERIOLOGY:**

- (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 micro organism 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
  - (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

**PATHOLOGY**  
**(For all branches)**

**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:**

- (1) Definition, Nomenclature
- (2) Characteristic of benign and malignant neoplasm
- (3) Metastasis in brief
- (4) Carcinogenesis in brief.

**HAEMOPOIETIC SYSTEM:**

- (1) Anemia
- (2) IDA, Megaloblastic, Thalassaemia, SCA, G6PD, deficiency, Haemophilia, Leukaemia
- (3) Lab investigation of haemorrhagic disorders.

**LIVER:**

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

**KIDNEY:**

- (1) Stones, Nephrotic Syndrome, Renal Function Test
- (2) ARF, CRF
- (3) Glomerular nephritis in brief.

**THYROID:**

- (1) Goitre, Thyroiditis
- (2) Hypo and Hyperthyroidism

**BONE:**

- (1) Osteomyelitis, TB
- (2) Common Tumors

**GALL BLADDER:**

- (1) Gall stones, Cholecystitis

**BLOOD GROUPS AND COAGULATION**

**PANCREAS:**

- (1) Diabetes Mellitus, Pancreatic Function Test

**1 THEORY**

**Paper I (5221) - General Bacteriology & Immunology**

**Bacteriology**

- (1) History of Microbiology
- (2) Principles, mechanism of different types of microscopes and their uses
- (3) Morphology of bacteria, Bacterial metabolism, Bacterial taxonomy and classification.
- (4) Sterilisation and disinfection
- (5) Growth and nutrition of bacteria and methods of cultivation
- (6) Isolation and identification of bacteria
- (7) Bacterial genetics and variation
- (8) Normal bacterial flora, zoonoses, epidemiology and transmission
- (9) Bacteriological examination of water, food, air and milk
- (10) Care, management, method of inoculation and uses of experimental laboratory animals
- (11) Antimicrobial chemotherapy.

**Immunology**

- (1) Anatomy, development and functions of immune system
- (2) Host and parasite relationship
- (3) Biology of immune response
- (4) Microbial pathogenicity and host immune response
- (5) Infection and immunity
- (6) Antigen and antibodies
- (7) Toxins, antitoxins
- (8) Complement
- (9) Antigen antibody reactions
- (10) Hypersensitivity
- (11) Vaccine and Immunisation
- (12) Immunodeficiency diseases
- (13) Autoimmunity, Immunological tolerance
- (14) Immunology of transplantation and malignancy
- (15) Immunohematology
- (16) Laboratory immunological procedures

**Paper II (5222) - Systematic Bacteriology & Clinical Microbiology**

**Systematic Bacteriology**

Properties, epidemiology, transmission, methods of isolation, identification, pathogenesis, toxins and enzymes production, antigen structures, clinical importance and laboratory diagnosis of the infection with the following bacteria :

- (1) Gram Positive Cocci: Staphylococcus, Streptococcus, Pneumococcus
- (2) Gram Negative Cocci : Neisseria
- (3) Gram Positive Bacilli :Corynebacterium, Bacillus, Clostridium
- (4) Non-sporing Anaerobes
- (5) Gram Negative Bacilli :Enterobacteriaceae, Vibrio, Pseudomonas, Acinetobacter, Yersinia, Pasteurella, Francisella, Haemophilus, Bordetella, Brucella
- (6) Mycobacterium: Mycobacterium tuberculosis, atypical Mycobacterium, Mycobacterium leprae

- (7) Spirochaetes
- (8) Mycoplasma
- (9) Actinomycetes,
- (10) Helicobacter, campylobacter and other miscellaneous bacteria
- (11) Rickettsia
- (12) Chlamydia
- (13) Immunology of bacterial infections.

### **Clinical Microbiology**

- (1) Surveillance sampling
- (2) O.T Sterility testing
- (3) Bacteriological examination of water, milk, food and air
- (4) Processing of clinical samples for pathogens
- (5) Hospital infections and biomedical waste management
- (6) Quality control in microbiology
- (7) Laboratory control of antimicrobial therapy
- (8) Collection of specimens for for bacteriological investigations
- (9) Methods of culture, techniques and organisms encountered in: CSF, blood culture, sputum, pus, urine, stool, UTI, endocarditis, Bone and joint infections
- (10) Bacteriological investigations in :
  - (a) PUO
  - (b) Tuberculosis
  - (c) Leprosy
  - (d) Meningitis
  - (e) Eye infections
- (11) Causative agents and investigations in case of :
  - (a) Food poisoning, gastroenteritis, diarrhoea
  - (b) Respiratory tract infections
  - (c) Sexually transmitted diseases
  - (d) Dental infections
  - (e) Blood transfusion and associated infections
  - (f) Immunoprophylaxis against diseases

### **Paper III (5223) Virology, Mycology, Parasitology and Recent Advanced in Microbiology**

#### **Virology**

- (1) General properties, cultivation, interferon and interference of virus.
- (2) Clinical importance and laboratory diagnosis of infections with the following viruses: Pox, Herpes, Adeno, Picorna, Myxo, Arbo, Rhabdo, Hepatitis, Miscellaneous virus.
- (3) Bacteriophages.
- (4) Oncogenic viruses
- (5) Slow viruses and Prion diseases
- (6) Human Immunodeficiency Virus (HIV)
- (7) Immunology of viral infections
- (8) Diagnosis of viral infections (Cell culture, serology and molecular methods of diagnosis)

#### **Mycology**

- (1) Morphology, cultivation, epidemiology, transmission, clinical importance and lab diagnosis of:
  - (a) Yeasts
  - (b) Yeast like

- (c) Moulds
- (d) Dimorphic fungus
- (2) Superficial, subcutaneous and deep fungal infections,
- (3) Opportunistic fungal infection
- (4) Laboratory contaminating fungus and mycotoxins
- (5) Immunology of mycotic infections

### **Parasitology**

- (1) Taxonomy and classification
- (2) Transmission, clinical features and prophylaxis of medically important
  - (a) Protozoa
  - (b) Cestodes
  - (c) Trematodes
  - (d) Nematodes
- (3) Immunology of parasitic diseases
- (4) Laboratory diagnosis of parasites

### **Recent Advanced in field of Medical Microbiology**

## **2 PRACTICAL**

### **Bacteriology**

- (1) Microscopy-Handling and general maintenance
- (2) Staining procedures-Preparation of stains and staining methodology
- (3) Growth and survival of micro organisms and estimation of microbial colonies by various procedures
- (4) Cultivation-Media preparation – details of ingredients, pH measurement, preparation of reagents, buffers, glass wares etc and quality control
- (5) Antimicrobial agents-Preparation, susceptibility testing, quality control, MIC, MBC
- (6) Sterilization and disinfection-Handling of main types of filters, preparation procedures for autoclaving hot air oven, testing of disinfectants
- (7) Care and maintenance of common laboratory instruments
- (8) Handling, maintenance and inoculation techniques of small laboratory animals
- (9) Collection of specimens for Microbiological investigations such as Blood, Urine, Throat swab, Rectal swab, Stool, Pus (swabs), OT and other specimens
- (10) Complete Characterisation of bacteria of medical importance including morphology, cultural, biochemical, serological, antimicrobial, susceptibility pattern and any other biological properties as well as molecular methods (if any)

### **Serology**

- (1) Blood collection and preservation for serological testing
- (2) Precipitation tests (including immunodiffusion tests)
- (3) Agglutination tests
- (4) ELISA
- (5) Rapid Diagnostic Serological Tests

### **Virology**

- (1) Rapid Tests for Diagnostics of Viral Infections



**Mycology**

- (1) Identification of fungus including direct microscopy, culture methods including slide culture, fungal staining.

**Parasitology**

- (1) Processing and identification of ova and cysts in stools samples including Wet mount & staining.
- (2) Peripheral blood examination for parasite identification.

**M.Sc (Med) Part –I (Main) Examination Month Year**  
**BRANCH: ANATOMY, PHYSIOLOGY, PHARMACOLOGY,**  
**BIOCHEMISTRY AND MICROBIOLOGY**

Paper I  
**Anatomy, Physiology and Biochemistry**

Time: Three Hours  
Maximum Marks: 75

Q. 1 is compulsory from each section and attempt any  
one question from rest of two questions in each sections  
Use separate answer book for each Section.

All the parts of one question should be answered at one place in sequential order

**Section-A**  
**(ANATOMY)**  
(25 Marks)

- |     |   |    |
|-----|---|----|
| Q.1 | Name the endocrine glands. Describe Suprarenal glands in brief. | 13 |
| Q.2 | Write short notes on  | 12 |
|     | (a) Synovial Joint  |    |
|     | (b) Gross Anatomy of Liver                                      |    |
| Q.3 | Write short notes on:   | 12 |
|     | (a) Supination and Pronation movement                           |    |
|     | (b) Corpus callosum   |    |

**Section B**  
**(PHYSIOLOGY)**  
(25 Marks)

- |     |   |    |
|-----|---|----|
| Q.1 | Mention the respiratory centers. Explain the neural regulation of respiration | 13 |
| Q.2 | Write short notes:  | 12 |
|     | (a) Micturition reflex  |    |
|     | (b) Role of platelets in thrombus formation                                   |    |
| Q.3 | Write short notes:  | 12 |
|     | (a) Function of Hypothalamus  |    |
|     | (b) Calcitonin  |    |

**Section C**  
**(BIOCHEMISTRY)**  
(25 Marks)

- |     |   |    |
|-----|---|----|
| Q.1 | Write classification of carbohydrates with properties of Monosaccharides. | 13 |
| Q.2 | Write short notes:<br>(a) Biological Oxidation<br>(b) Enzyme inhibition   | 12 |
| Q.3 | Write short notes:<br>(a) DNA polymerase<br>(b) Liver function test       | 12 |

**M.Sc (Med) Part –I (Main) Examination Month  
Year BRANCH: BIOCHEMISTRY,  
MICROBIOLOGY**

**Paper II  
Pathology and Microbiology**

**Time: Three Hours**

Maximum Marks: 75

Q. 1 is compulsory from each section and attempt any Two questions from rest of three questions in each Use separate answer book for each Section.

All the parts of one question should be answered at one place in sequential order

**Section-A (PATHOLOGY)  
(38 Marks)**

- |     |  |    |
|-----|--|----|
| Q.1 | Define inflammation, discuss in detail chemical mediators of inflammation.   | 14 |
| Q.2 | Write short notes on: (any three out of four)<br>(a) Alcoholic Hepatitis<br>(b) Complications of Diabetes Mellitus | 12 |
| Q.3 | Enumerate:<br>(a) Types of Glomerulonephritis<br>(b) Types of Bone tumors  | 12 |
| Q.4 | Write short notes on:<br>(a) Liver function tests<br>(b) Renal function tests                                      | 12 |

**Section  
(MICROBIOLOGY)  
(37 Marks)**

- Q.1 Define Sterilization. How does it differ from disinfection? Classify the various agents used in sterilization. Add a note on the principle and functioning of autoclave. 13
- Q.2 Write briefly on:- 12  
(a) Kirby-Bauer Disc Diffusion method  
(b) Anaerobic culture methods
- Q.3 Write short notes on: 12  
(a) Polymerase chain reaction  
(b) Biological safety cabinet
- Q.4 Write short notes on: 12  
(a) Dark ground microscope  
(b) Structure of Transposon

**M.Sc (Med) Microbiology Part –II (Main)**  
Examination Month Year  
**MICROBIOLOGY**

Paper I  
**General Bacteriology and Immunology**

Time: Three Hours  
Maximum Marks: 100

Attempt all questions

- Q.1 Define sterilization. Name various agents used for Sterilization and write in detail sterilization by moist heat. 25
- Q.2 Write short Notes (any two) 25  
(a) Hypersensitivity Type IV reaction  
(b) Bacterial Cell wall  
(c) Bacterial Growth Curve
- Q.3 Name various antigen-antibody reactions and describe the principle and applications. 25
- Q.4 Short Notes (any two) 25  
(a) Gene Transfer  
(b) Segregation and disposal of microbial waste  
(c) Surface antigen of Influenza virus

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Examination Month Year  
**MICROBIOLOGY**

Paper II  
**Systematic Bacteriology & Clinical Microbiology**

Time: Three Hours  
Maximum Marks: 100

Attempt all questions

All the parts of one question should be answered at one place in sequential order

- Q.1 Enumerate the bacteria causing diarrhea. Describe Antigenic characteristics, clinical infections and Laboratory diagnosis of E coli. 25
- Q.2 Write short notes (any two) 25  
(a) Pathogenesis and laboratory diagnosis of Typhoid fever  
(b) Pathogenesis and laboratory diagnosis of Diphtheria  
(c) Common Zoonotic diseases and laboratory procedures for bacterial zoonosis
- Q.3 Classify Mycobacteria. Define Multi drug resistant Tuberculosis and mention current trends of laboratory diagnosis. 25
- Q.4 Write short notes (any two) 25  
(a) PCR (polymerase chain reaction)  
(b) Anaerobic bacteria and laboratory diagnosis for Tetanus and Gas gangrene  
(c) Gram negative bacteria and lab diagnosis of Urinary tract infection

**M.Sc (Med) Microbiology Part –II (Main)**  
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**MICROBIOLOGY**

Paper III

**Virology, Mycology, Parasitology and Recent Advanced in Microbiology**

Time: Three Hours  
Maximum Marks: 100

Attempt all questions

All the parts of one question should be answered at one place in sequential order

- |     |  |    |
|-----|--|----|
| Q.1 | Describe the morphology of rabies virus and discuss the Pathogenesis, laboratory diagnosis of Rabies vaccine | 25 |
| Q.2 | Write short notes (any two)<br>(a) Bacteriophage<br>(b) Mycotoxins<br>(c) Cysticercosis                      | 25 |
| Q.3 | Describe the life cycle, pathogenesis and laboratory diagnosis of Plasmodium falciparum                      | 25 |
| Q.4 | Write short notes (any two)<br>(a) Dermatophytes<br>(b) Candida albicans<br>(c) HIV Virus                    | 25 |