

REGULATIONS AND CURRICULUM
M.Sc – Medical Courses



JSS UNIVERSITY

(Established under section 3 of UGC Act, 1956)

**JSS Medical Institutions Campus,
Sri Shivarathreeshwara Nagara,
Mysore - 570 015, Karnataka, India**

GOALS AND GENERAL OBJECTIVES OF POSTGRADUATE M.Sc IN MEDICAL SCIENCE

GOAL

The goal of postgraduate M.Sc in medical sciences shall be to produce competent medical teachers.

- i. who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and
- ii. who shall have acquired the basic skills in teaching of the medical and paramedical professionals;

GENERAL OBJECTIVES

At the end of the postgraduate training in the discipline concerned the student shall be able to;

- i. Demonstrate competence in basic concepts of research methodology and be able to critically analyze relevant published research literature.
- ii. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students and paramedical health workers.

COMPONENTS OF THE COURSE CURRICULUM :

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical skills
- Thesis skills.
- Attitudes including communication skills.
- Training in research methodology.

Regulations

1. Courses offered in M.Sc medical sciences:

- a) M.Sc in Anatomy
- b) M.Sc in Biochemistry,
- c) M.Sc in Microbiology
- d) M.Sc in Pharmacology
- e) M.Sc in Physiology

2. Eligibility for Admission

A candidate seeking admission to M.Sc medical science course should have a bachelor degree under recognized university.

3. Qualifications

The candidate must have passed B.Sc with atleast one subject of biological Sciences or BAMS or MBBS or BHMS or BPT or B.Pharm or any other professional graduates from a recognized University.

4. Duration of the course:

Duration shall be for a period of 3 years.

5. Attendance

Candidates should have attended at least 80% of the total number of classes conducted in an academic year, from the date of commencement of the term to the last working day, as notified by the University, in each of the subjects prescribed for that year, separately in theory and practical, to be eligible to appear for the university examinations.

6. Monitoring Progress of Studies:

Periodic tests: The concerned departments conduct exams, from first year to third year. The tests may include written papers, particles and viva voce. Records and marks obtained in such tests will be maintained by the Head of the Department and sent to the University, when called for.

Records: Records and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University.

7. Dissertation

Every candidate pursuing M.Sc degree course is required to carry out work on a selected research project under the guidance of a recognized post graduate teacher in their respective subjects in **second and final year**. The results of such a work shall be submitted in the form of a dissertation.

8. Schedule of Examination

The university examination for M.Sc courses shall be held at the end of first and third academic year.

9. Scheme of Examination

I year M.Sc (preliminary) exam:

INTERNAL ASSESSMENT: (50 marks in each subject)

Three tests, 1st IA at the end of 3rd month, 2nd internal at the end of 6 month, 3rd internal exam at the end of completing I year course. Average of best two is taken for internal assessment. A candidate should get minimum 35% IA marks to take the university exam.

UNIVERSITY EXAMINATION:

Theory – 3 hours paper, 100 marks each in Anatomy, Physiology and Bio-chemistry.

Pattern of theory question paper

Type of Questions	Theory		
	Number of Questions	Marks for each question	Total
Long Essay	2	10	20
Short Essay	10	5	50
Short Answer	10	3	30
Total Marks			100

NO PRACTICAL EXAMINATION FOR I YEAR M.Sc (medical) STUDENTS.

Criteria for declaring as pass in University Examination: A candidate should get 50% marks in each subject (Theory including IA marks).

A candidate securing less than 50% of marks as described above shall be declared to have failed in the examination. Failed candidate may appear in subsequent examination upon payment of fresh fee to the Registrar (Evaluation).

A successful candidate is awarded pass class irrespective of percentage, as these marks will be considered while awarding the class at the end of final year.

Carry over system: A candidate who has failed in one or more subject in the **I year university examination** can be permitted to enter II year, **the candidate should clear all the I year subjects 6 months before taking the final year university exams.**

For the declaration of the class at the end of final year candidate must have passed all the subjects in first attempt. Otherwise the result will be declared as pass class.

Syllabus for I year M.Sc (Medical) Anatomy:

General anatomy, Regional anatomy, General embryology and systemic, Histology, and Genetics.

General anatomy includes introduction to anatomy, Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Myology – classification with examples, types of skeletal muscles, tendon, aponeurosis, Nervous system – subdivisions, types of cells in CNS, neuron - structure, types, ganglia and nuclei, plexuses.

Regional anatomy – Head and neck – gross including osteology and radiology, Thorax – gross including osteology and radiology, abdomen and pelvis – gross including osteology and radiology.

General embryology includes introduction, mitosis and meiosis, gametogenesis, fertilization, implantation, bilaminar germ disc, notochord formation, trilaminar germ disc, embryonic folds, fetal membranes, placenta.

Systemic embryology includes pharyngeal arches and pouches, development of face and palate, GIT, Respiratory system, CVS, UG system.

Histology – microscopy, basic tissues, blood vessels, lymphoid tissue, salivary glands, tongue, oesophagus, stomach, small intestine, large intestine, pancreas, liver, gall bladder, trachea, lung, kidney, ureter, urinary bladder, testis, epididymis, vas deferens, prostate, ovary, uterus, fallopian tube, placenta, pituitary gland, thyroid and parathyroid glands, suprarenal gland, and skin.

Genetics – introduction, chromosomes, inheritance, karyotyping, chromosomal abnormalities, inborn errors of metabolism and genetic counselling.

PRACTICAL SYLLABUS M.Sc I year:

Demonstration of dissected specimens – Region wise Thorax, Abdomen and pelvis, Head and Neck and Brain including osteology and radiology.

Histology – Study of histology slides - system wise.

Distribution of theory and practical hours:

4 hours theory/week.

2 hours practicals/week for gross anatomy.

2 hours practicals for histology.

RECOMMENDED TEXT BOOKS

I Gross Anatomy

1. Clinical Anatomy for Medical Student By R.S. Snell 7th Edition 2003
Lippincott Williams & Wilkins
3. Grants Atlas of Anatomy By A. Agur, M. Lec 11th Edition 2004

II. Histology

1. Histology: A text & atlas By M.H. Ross 4th Edition 2002 G.I. Kaye, W. Pawlina Lippincott Williams & Wilkins
2. DiFiore's- Atlas of Histology with By V. Eroschenko Functional correlations International Edition 10th Edition 2004

III Developmental Anatomy

1. Langman's- Medical Embryology T. Sadler with Simbryo Version 1CD-ROM Lippincott, Williams and Wilkins 9th Edition 2003

IV Neuroanatomy

1. Clinical Neuroanatomy By Richard S. Snell for Medical Students Lippincott, William and Wilkins 5th Edition 2001

UNIVERSITY EXAMINATION

THEORY : 100 Marks

Distribution of chapters for anatomy paper with weightage of marks for University Examination

Anatomy	
Topics	Marks
Head and Neck	25
Brain, Spinal cord	10
Abdomen, pelvis and perineum	25
Thorax including diaphragm	15
General Anatomy - 05 Embryology - 10 Histology - 10	25
Total	100

For passing candidate should get 50% in theory including Internal assessment.

**Maximum marks theory – 100
Internal assessment - 50**

Syllabus for I year M.Sc (Medical) PHYSIOLOGY

I. General physiology:

Organisation of the cell and its functions
Structure of cell membrane, cell organelles
Intercellular communications
Transport across cell membrane
Membrane potentials
Body fluid compartments and changes in body fluid compartments, oedema and dehydration, osmolarity and osmolality
Homeostasis, concepts of physiological norms, range and variations
Genetic control of protein synthesis, apoptosis, programmed cell death.

II. Blood:

Composition and functions of blood
Plasma proteins – Types, normal values, origin, functions, variation in health and diseases
Red blood cells – erythropoiesis definition, sites and stages of erythropoiesis, regulation
Morphology of RBC, functions, normal values, variations, PCV and ESR, determination, anemias and its clinical significance
Haemoglobin – structure, functions, types, derivatives, methods of estimation, normal values, anemias, types and features
Life span and destruction of RBC, RE system, functions, jaundice, types
Leucocytes – leucopoiesis, sites of granulopoiesis, lymphopoiesis and monocytopoiesis
Morphology of different types of leucocytes, functions, variations, immunity, transplantation of tissues and organs
Platelets – thrombopoiesis, sites, stages, morphology, functions, normal values and variation
Hemostasis and blood coagulation – definition, clotting factors, mechanism of clotting
Clot retraction, fibrinolysis, bleeding disorders, tests for clotting, anticoagulants, actions and uses
Blood groups – ABO system and Rh factor
Blood transfusion – indications, types, reactions, lymph – origin, circulation, functions of lymph and lymph nodes, blood volume, determination, regulations

III. Nerve and muscle:

Structure of a neuron and classification of nerve fibers, properties, potential in nerve fibers, degeneration and regeneration of Nerve fibers, Neuroglia
Muscle: types, physiological anatomy of skeletal muscle
Neuromuscular junction and myasthenia gravis and NMJ blocking drugs
Mechanism of muscle contraction and its molecular basis, types of contraction – isotonic and isometric contractions
Energetics of muscle contraction – Rigor mortis
Types and properties of muscle fiber
Structure and types of smooth muscle
Contraction of smooth muscle

IV. Gastrointestinal system:

Introduction – Anatomy of GI tract, salivary secretion, types of salivary glands, innervations, composition of saliva, regulation, functions
Gastric secretion – structure of gastric mucosa, innervation, origin, composition and function of gastric juice, mechanism of secretion of HCL, functions
Regulation of gastric secretion, methods of study, phases of gastric secretion, factors influencing gastric secretion, peptic ulcer
Pancreatic secretion – structure of pancreas, innervations, composition and functions of pancreatic juice, Mechanism of secretion, regulation, tests for pancreatic exocrine function
Liver and gall bladder – function of liver, composition and functions of bile, function of gall bladder, filling and emptying, regulation, cholecystectomy, gall stones
Small intestine – structure, composition and function of succus entericus, regulation, large intestine – structure, function, secretion
Gastro-intestinal motility – stages of deglutition, mechanism, disturbances, types of movement, gastric emptying regulation
Movement of small intestine – types, regulation, ileo-caecal valve, functions, movements of colon, defecation
Gastro-intestinal hormones and their actions, digestion of carbohydrates, proteins and fats
Absorption of carbohydrates, proteins, fats, vitamins, water and electrolytes

V. Kidney, skin and temperature regulation:

Functional anatomy of kidney, renal blood flow, its determination, regulation and peculiarities
GFR – definition, measurement, filtration membrane, forces involved, control of GFR
Tubular function – reabsorption, secretion and concentration mechanism
Nerve supply to urinary bladder, micturition, Non excretory functions of kidney
Renal function tests
Skin and its functions and temperature

VI. Respiration:

Introduction – functional anatomy of respiratory tract
Pulmonary ventilation – mechanism of ventilation, muscles, pressure changes, pressure volume inter relationship, compliance, airway resistance
Surfactant – source, chemical nature, functions, lung volumes and capacities, definition, determination, normal values, significance
Alveolar ventilation – dead space, significance, pulmonary circulation, ventilation perfusion ratio and its significance
Respiratory membrane, partial pressure of gases, diffusion of gases, diffusion capacity, factors affecting diffusion of gas
Oxygen transport – forms of transport, O₂ – Hb dissociation curve, factors affecting it, myoglobin
CO₂ transport – form of transport, CO₂ dissociation curve, chloride shift, Haldane effect
Regulation of respiration – organization of respiratory centers, Non-chemical regulation, respiration and acid-base balance
Hypoxia – types, effects, voluntary hyperventilation, periodic breathing
Dyspnoea, Asphyxia, Cyanosis, Decompression sickness, Artificial respiratory methods
Pulmonary function tests, respiratory adjustments during muscular exercise

VII. Cardio vascular system:

Functional anatomy of heart, blood vessels, conducting system, systemic and pulmonary circulation
Innervation of the heart and blood vessels, VMC
Haemodynamics
Properties of cardiac muscle
Cardiac cycle
Heart rate and regulation of heart rate
Cardiac output definitions, variations, method of determination, regulation
Blood pressure
Shock
Regional circulation
Cardio vascular changes during muscular exercises

VIII. Endocrines:

Introduction to endocrinology, classification, general properties and mechanism of action of hormones

Pituitary gland – anterior pituitary hormones, their actions, control and disorders, actions, control and disorders of posterior pituitary hormones
Thyroid gland – synthesis, actions of iodine containing thyroid hormones, control of secretion, thyroid function tests and disorders
Calcium – functions, control- parathormone, calcitonin and 1-25 (OH) D -23 disorders
Endocrine pancreas – Insulin and Glucagon, source, actions, regulation, clinical disorders
Adrenal gland – adrenal cortex – nomenclature, actions, control, disorders, adrenal medullary hormones – synthesis, actions and control

IX. Reproduction:

Introduction

Male reproductive system – physiological anatomy, spermatogenesis and its regulation, testicular hormones, composition of semen

Female reproductive system – menstrual cycle, pregnancy and parturition, lactation and family planning

X. Central nervous system:

Organization of central nervous system

Synapse – transmission and properties, neurotransmitters

Receptors and properties

Sensory system – primary sensations, ascending tracts and sensory cortex

Pain sensation and thalamus

Spinal cord – reflexes

Motor tracts, basal ganglia, control of motor ganglia, vestibular apparatus, cavity and postural reflexes

Hypothalamus, ANS, Limbic system, prefrontal lobe

Higher mental functions

Sleep and EEG

Learning and memory

Language and speech

CSF and blood brain barrier (BBB)

XI. Special senses:

Vision – functional anatomy of eye

Aqueous humour, IOP, Glaucoma

Optics of eye

Image forming mechanism

Visual activity

Errors of refractions
Retina – structure and electrical activity of photoreceptors
Visual pathway and its lesion, visual cortex, depth perception
Accommodation, dark adaptation, papillary reflexes
Colour vision with applied aspect.

Hearing – functional anatomy of ear

Physics of sound
Role of tympanic membrane, middle ear and cochlea in hearing
Auditory pathway and auditory cortex
Tests for hearing and deafness.

Taste and smell – modalities, receptors, pathways, cortical and limbic areas associated with taste and smell, olfaction and memory.

PRACTICAL SYLLABUS M.Sc I year:

Study of the microscope
Hemoglobin estimation and Packed cell volume estimation
Study of Haemocytometer and Red cell count
Blood indices
Rouleaux formation and Erythrocyte sedimentation rate
Behaviors of RBCs in different tonicities of sodium chloride solution and osmotic fragility
Construction of Price-Jones curve
Determination of blood groups, major and minor, cross matching, Determination of agglutinin
White cell count
Preparation and staining of a peripheral smear: Differential leucocyte count
Arneeth count: sex differences in Neutrophil, Absolute Eosinophil count
Reticulocyte count
Platelet count
Laboratory tests for haemostasis: Bleeding time, clotting time, prothrombin time, clot retraction
Clinical examination of CVS, Respiratory system and cranial nerves.
Demonstration of Human experiments (Spirometry, ECG)

RECOMMENDED TEXT BOOKS

1. GUYTON (Arthur C), Text of Medical Physiology 11th Edition, 2008, Prism Publishers, Bangalore.
2. GANONG (William F), Review of Medical Physiology, 23rd Edition, and Lange.
3. CHAUDHURI (Sujith K), 5th Edition Concise Medical Physiology New Central Books, Calcutta.
4. TORTORA (Gerald J), Principles of anatomy and physiology 11th Edition John Waley & Sons, Ref. college publication.
5. A.K. Jain – Textbook of Medical Physiology, 4th Edition 2008.
6. BIJLANI (RL), Understanding medical physiology; text book for medical students, Jaypee Brothers, New Delhi
7. Shambulingam – Text book of Physiology.

UNIVERSITY EXAMINATION

THEORY : 100 Marks

Distribution of chapters for anatomy paper with weightage of marks for University Examination

PAPER - I	
Subjects	Marks
General Physiology	03
Blood	10
Cardiovascular system	12
Respiratory system	10
Gastrointestinal system	09
Renal system	06
Endocrine	10
Special senses	09
Reproduction	06
Central Nervus system	14
Muscle-Nerve	08
Skin & Body Temperature	03

For passing candidate should get 50% in theory including Internal assessment.

Maximum marks theory – 100

Internal assessment - 50

Syllabus for I year M.Sc (Medical) Bio-chemistry:

THEORY

I. Introduction

Importance and scope of medical biochemistry in prevention, diagnosis and therapeutics of diseases

II. Cell Biology

- a. Cell membrane – structure and composition
- b. Functions of cellular structures
- c. Transport across the cell membrane
 - i. Facilitated diffusion
 - ii. Passive transport
 - iii. Active transport
 - iv. Receptor mediation
 - v. Endocytosis and exocytosis

III. Chemistry of Carbohydrates

- a. Definition, classification and their biological importance
- b. Monosaccharides – structure, classification and properties (along with important derivatives of monosaccharides and reactions of carbohydrates)
- c. Isomerism and stereoisomerism
- d. Disaccharides & oligosaccharides-structure, properties & importance
- e. Polysaccharides – homo and heteropolysaccharides – structure, distribution and functions
- f. Dietary fibres

IV. Chemistry of amino acids, peptides and proteins

- a. Amino acids – Structure, types, various classifications and properties
- b. Peptides – structure and functions of biologically important peptides e.g. Glutathione, oxytocin and vasopressin, ANP and BNP

- c. Proteins – definition, classifications, functions, properties (physical and chemical), structural organization, structure- function relationship with reference to hemoglobin
- d. Separation techniques – electrophoresis and chromatography

V. Chemistry of lipids

- a. Definition, classification, properties and biological importance
- b. Simple lipids – Structure, distribution and functions
- c. Compound lipids – phospholipids, sphingolipids, glycolipids – composition, distribution and functions
- d. Derived lipids – fatty acids, steroids, eicosanoids – chemistry, distribution, classification and functions

VI. Chemistry of nucleic acids

- a. Purines and pyrimidines – structure, structural analogues and their clinical applications
- b. Nucleoside, nucleotide and other biologically important nucleotides
- c. Nucleic acids – definition, types
- d. DNA – structure, types of DNA and functions
- e. RNA – structure, types and functions

VII. Enzymology

- a. Definition, classification, properties
- b. Coenzymes and cofactors (apoenzyme, holoenzyme, cofactors and activators)
- c. Mechanism of enzyme action
- d. Factors affecting enzyme activity and K_m , its significance (derivation not required)
- e. Enzyme inhibition – types with Lineweaver-Burk plots and clinical importance
- f. Enzyme regulation – modes, mechanism and importance
- g. Isoenzymes – definition, chemistry, separation and clinical importance
- h. Diagnostic and therapeutic importance of enzymes
- i. Proenzymes, multienzyme complex and metalloenzymes

- j. RIA and ELISA

VIII. Vitamins

- a. Definition and classification
- b. Chemistry, sources, absorption and transport, biochemical role, RDA, and deficiency, antivitamins and hypervitaminosis of fat and water soluble vitamins

IX. Minerals

- a. Classification, sources, absorption, transport, fate, metabolism, biochemical functions, excretion, regulation, RDA, deficiency manifestations of the following: calcium, phosphorous, iron, copper, iodine, zinc, fluoride, magnesium, manganese, selenium, sodium, potassium and chloride.

X. Bioenergetics and Biological Oxidation

- a. Redox potential, concept of bioenergetics in relation to thermodynamics
- b. High energy compounds
- c. Enzymes involved with special reference to oxygenases
- d. Shuttle mechanisms
- e. Components and organization of respiratory chain in mitochondria
- f. Oxidative phosphorylation
- g. Formation of ATP and its regulation
- h. Inhibitors and uncouplers (Brown adipose tissue and thermogenesis)

XI. Digestion and absorption

- a. Carbohydrate
- b. Lipids
- c. Proteins
- d. Malabsorption syndromes and other related disorders

XII. Metabolism of carbohydrates

- a. Glucose transporters
- b. Glycolysis
- c. Oxidation of pyruvate
- d. TCA cycle
- e. Gluconeogenesis, Cori's cycle
- f. Metabolism of glycogen (glycogenesis, glycogenolysis, storage disorders)
- g. HMP shunt pathway
- h. Metabolism of fructose, galactose, uronic acid pathway, inborn errors associated with them
- i. Blood glucose regulation
- j. Diabetes Mellitus – etiology, metabolism in Diabetes Mellitus, biochemical basis of acute and chronic complications, laboratory diagnosis and monitoring (Glycated Hb, Fructosamine)
- k. Glucose tolerance test and glucose challenge test

XIII. Metabolism of amino acids and proteins

- a. Dynamic state of body proteins, protein turnover, nitrogen balance
- b. Cellular reactions of amino acids
- c. Formation, transport and disposal of ammonia (urea cycle)
- d. Metabolism of amino acids – glycine, serine, aromatic amino acids, sulphur containing amino acids, histidine, arginine, glutamic acid, branched chain amino acids (first three steps) and metabolic disorders associated with them along with laboratory diagnosis.
- e. Specialized products obtained from amino acid metabolism and their importance (Polyamines, creatine, nitric oxide)*

XIV. Metabolism of lipids

- a. oxidation of fatty acids – alpha, beta, omega – beta oxidation of odd chain and even chain fatty acids along with disorders
- b. Formation and utilization of ketone bodies and ketosis
- c. De novo synthesis of fatty acids, elongation and desaturation
- d. Phospholipids (lecithin and cephalin only) and triglycerides – formation and breakdown

- e. Lipid storage disorders
- f. Synthesis of cholesterol (only crucial intermediates), Fate of cholesterol and other compounds derived from cholesterol
- g. Lipoproteins – classification, metabolism, functions and disorders
- h. Atherosclerosis and role of PUFA in preventing atherosclerosis
- i. Eicosanoids
- j. Metabolism in adipose tissue, fatty liver and lipotropic factors

XV. Metabolism of nucleic acids

- a. Biosynthesis and breakdown of purine and pyrimidine nucleotides
- b. Salvage pathways and disorders

XVI. Intermediary metabolism

- a. Integration of carbohydrate, protein and lipid metabolism
- b. Regulation by hormones in starvation, well fed state and diabetes mellitus
- c. Methods of study of intermediary metabolism

XVII. Hemoglobin metabolism

- a. Biosynthesis of heme, regulation and porphyrias
- b. Degradation of hemoglobin
- c. Biochemical basis of jaundice and distinguishing features of different types of jaundice
- d. Hemoglobin variants and Hb derivatives
- e. Abnormal hemoglobins, hemoglobinopathies and thalassemia

XVIII. Genetics and Molecular biology

- a. DNA replication
- b. Transcription, post transcriptional modifications, reverse transcriptase
- c. Genetic code, translation, post translational modifications

- d. Regulation of gene expression, mutation, Polymerase Chain Reaction, recombinant DNA technology, gene therapy, blotting techniques, Restriction Fragment Length Polymorphism, DNA fingerprinting

XIX. Nutrition

- a. Nutrients, Calorific value of food, BMR, SDA, respiratory quotient and its applications
- b. Balanced diet based on age, sex and activity, biological value of proteins, nitrogen balance
- c. Protein energy malnutrition – kwashiorkor and marasmus
- d. Biochemistry of starvation and obesity
- e. Dietetics, Total parenteral nutrition, dietary fibres

XX. Acid base balance

- a. Basic concepts of acids, bases, buffers, pH, H ion concentration, derivation of Henderson – Hasselbach equation with its applications
- b. pH of blood and its regulation
- c. Anion gap and its importance
- d. Acidosis, alkalosis, assessment of acid-base status

XXI. Water and electrolyte balance

- a. Body water compartments, Donnan membrane equilibrium, osmolality, electrolytes concentration in body fluid compartments, water balance, regulation of water balance
- b. Electrolyte balance, regulation and its disorders

XXII. Function tests

- a. Liver function tests
- b. Renal function tests
- c. Thyroid function tests

XXIII. Endocrinology

Classification of hormones, mechanism of hormone action, Mechanism of action of insulin, glucagon, epinephrine and steroid hormones

XXIV. Plasma proteins

- a. Classification, site of synthesis, functions, electrophoretogram in health and disease
- b. Acute phase proteins
- c. Immunoglobulins – structure, types, functions and associated disorders

XXV. Metabolism of Xenobiotics

XXVI. Radioisotopes and their application in medicine

XXVII. Biochemistry of cancer

- a. Carcinogens
- b. Oncogenes
- c. Growth factors
- d. Tumor markers

XXVIII. Myocardial Infarction

- a. Causes
- b. Cardiac markers
- c. Lipid profile

XXIX. Free radical and antioxidants

XXX. Quality control

XXXI. Biomedical waste management

PRACTICALS SYLLABUS:

- I. Introduction
- II. Demonstration – reactions of carbohydrates
- III. Reactions of glucose, fructose and xylose
- IV. Reactions of lactose and maltose
- V. Reactions of sucrose and starch
- VI. Identification of unknown carbohydrate
- VII. Demonstration - Precipitation reactions of albumin and casein
- VIII. Precipitation reactions of albumin and casein
- IX. Demonstration – colour reactions of proteins
- X. Colour reactions of albumin
- XI. Colour reactions of casein
- XII. Identification of unknown protein
- XIII. Demonstration and practical – reactions of NPN substances
- XIV. Identification of substance of physiological importance
- XV. Demonstration - Analysis of normal urine
- XVI. Analysis of normal urine
- XVII. Demonstration – analysis of abnormal urine
- XVIII. Analysis of abnormal urine
- XIX. Spectroscopic examination of hemoglobin derivatives and preparation of hemin crystals
- XX. Spot test for Phenylketonuria, alkaptonuria, homocystinuria
- XXI. Spotters
- XXII. Estimation of blood glucose and interpretation
- XXIII. Estimation of blood urea and interpretation
- XXIV. Estimation of urinary creatinine and calculation of creatinine clearance and interpretation
- XXV. Estimation of serum inorganic phosphate and interpretation
- XXVI. Estimation of serum total protein, albumin and A/G ratio and interpretation
- XXVII. Interpretation of charts and case reports

- XXVIII. Principles of colorimetry
- XXIX. Paper chromatography
- XXX. Electrophoresis
- XXXI. GTT and OGCT
- XXXII. Determination of ALT and AST
- XXXIII. Estimation of serum cholesterol
- XXXIV. Principles of flame photometry and Ion Selective Electrode
- XXXV. Estimation of serum bilirubin
- XXXVI. Determination of glucose and proteins in CSF
- XXXVII. Estimation of albumin in urine and tests for Bence Jones proteins in urine

RECOMMENDED TEXT BOOKS

1. *MURRAY (Robert.K.M)*, Harpers Illustrated Biochemistry. Published by Lange Medicals
2. *D.M.VASUDEVAN and SREEKUMARI.S* Textbook of Biochemistry for Medical students, published by Jaypee Medical Publishers, New Delhi
3. *CHAMPE, HARVEY & FERRIER*. Lippincott's illustrated reviews of Biochemistry. Published by Lippincott, Williams and Wilkins
4. *U. SATYANARAYANA* Textbook of Biochemistry published by Books and Allied (P) Ltd.
5. *DEBAJYOTI DAS* Biochemistry. Published by Academic publishers.

Weightage of marks in university examination

Sl. No	Topic	Weightage of Marks
1	Cell structure and function, sub cellular organdies, cell membranes, transport across the membranes	5
2	Chemistry, digestion, absorption and metabolism of Carbohydrates	15
3	Amino acids and protein chemistry, general reactions of amino acids, digestion and absorption, urea cycle and metabolism of amino acids	15
4	Chemistry, digestion, absorption and metabolism of lipids	15
5	Enzymes	15
6	Biological oxidation, integration of metabolism and regulation of metabolism	10
7	Detoxification and Xenobiotics	5
8	Free radicals and antioxidants	5
9	Endocrine function	5
10	Biochemistry of cancer, oncogenes and tumour markers	5
11	Bio-medical Waste	5
12	Nucleotides and nucleic acid chemistry	5
13	Nucleotides and Nucleic acid metabolism	10
14	Protein Biosynthesis, Molecular genetics, regulation of gene expression, recombinant DNA technology, PCR, Human Genome Project & gene therapy	10
15	Vitamins	15
16	Minerals	10
17	Water and Electrolyte balance, Acid - base balance	10
18	Nutrition and energy metabolism	10
19	Heme metabolism, normal and abnormal hemoglobins, Plasma proteins and immunoglobulins	10
20	Liver function tests	5
21	Kidney function tests, Thyroid Function tests	5

22	Radio-isotopes, Cardiac Markers	5
23	Clinical chemistry, SI Units, quality control, interpretation and reference values and analysis	5

Note:

- a. Weightage of marks assigned to chapters/topics may add to more than 100.
- b. Long essay questions may be asked from topics with weightage of 10 & 15 marks.
- c. Short Essay and short answer questions may be asked from any of the topics.

M.Sc (MEDICAL) FINAL YEAR CURRICULUM AND SYLLABUS:

ANATOMY, PHYSIOLOGY, BIO-CHEMISTRY, PHARMACOLOGY AND MICROBIOLOGY.

TEACHING EXPOSURE:

1. In order to get the teaching experience, post-graduates are suppose to take practical classes for MBBS/ BPT/BDS and other allied health science students (Dissection and Histology).
2. Post-graduates should present seminars/Journal club at regular intervals.

DISSERTATION WORK:

During the course of study every candidate has to prepare a dissertation work on a selected topic under the guidance of a recognized post-graduate teacher.

The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, and comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the II year on or before the dates notified by the University. The synopsis shall be sent through the proper channel.

Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.

The dissertation should be written under the following headings

- i. Introduction

- ii. Aims or Objectives of study
- iii. Review of Literature
- iv. Material and Methods
- v. Results
- vi. Discussion
- vii. Conclusion
- viii. Summary
- ix. References
- x. Tables
- xi. Annexure

Six copies of dissertation thus prepared shall be submitted to the Registrar (Evaluation), six months before final examination on or before the dates notified by the University.

The dissertation shall be valued by examiners appointed by the University. Approval of dissertation work is an essential precondition for a candidate to appear in the University examination.

A Co-guide may be included provided the work requires substantial contribution from a sister department or from another medical institution recognised for teaching/training by J.S.S University. The co-guide shall be a recognised post graduate teacher of J.S.S University.

Change of guide: In the event of a registered guide leaving the college for any reason or in the event of death of guide, guide may be changed with prior permission from the university.

SCHEME OF EXAMINATION:

University examination:

Consists of Theory, Practical and Viva voce.

Theory: shall consist of three question papers, each of three hours duration. Each paper shall carry 100 marks. Each paper shall consist of two long essay questions each question carrying 20 marks and 4 short essay question each carrying 10 marks and 4 short

answers question carrying 5 marks. Total marks for each paper will be 100. Questions on recent advances may be asked in any or all the papers.

Practical Examination:

In case of practical examination, it should be aimed at assessing competence and skills of techniques and procedures as well as testing students ability to make relevant and valid observations, interpretations and inference of laboratory or experimental work relating to his/her subject.

The total marks for Practical examination shall be 200.

Viva Voce: Viva Voce Examination shall aim at assessing depth of knowledge, logical reasoning, confidence and oral communication skills. The total marks shall be 100 and the distribution of marks shall be as under:

- | | |
|--|----------|
| (i) For examination of all components of syllabus,
discussion of the dissertation topic | 80 Marks |
| (ii) For Pedagogy | 20 Marks |

Examiners: There shall be at least two examiners in each subject. Out of them one shall be external examiner and one shall be internal examiner.

Any professor with M.D degree with 10 years of teaching experience or professor with Ph.D degree in their respective subject with 5 years of teaching experience are eligible to become examiner.

Criteria for declaring as pass in University Examination: A candidate should get 50% marks in (1) Theory, (2) Practical and viva-voce examination separately.

A candidate securing less than 50% of marks as indicated above shall be declared to have failed in the examination. Failed candidate may appear in subsequent examination upon payment of fresh fee to the Registrar (Evaluation).

Declaration of distinction: A successful candidate passing the University examination in

first attempt will be declared to have passed the examination with distinction, if the grand total aggregate mark is **75% and above**. And First class, if the grand total aggregate mark is **65% and above**.

Distinction and First class will not be awarded for candidates passing the examination in more than one attempt either in I year or in Final year or Both.

SYLLABUS FOR FINAL YEAR M.Sc (Medical) ANATOMY

General anatomy, General embryology and Systemic, Regional anatomy, Histology, Comparative anatomy, Anthropology, Surface anatomy and Genetics.

General anatomy:

Introduction, subdivisions of anatomy, anatomical position, anatomical planes, anatomical terms, Cell, cell division, Basic tissues, Skin, Superficial fascia and deep fascia, modifications of deep fascia, Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Myology – classification with examples, types of skeletal muscles, tendon, aponeurosis, Nervous system – subdivisions, types of cells in CNS, neuron - structure, types, ganglia and nuclei, plexuses, Cardiovascular system – blood vessels, anastomosis, types of circulation, lymphatic system – components of the lymphatic system.

General embryology:

Introduction, gametogenesis, structure of sperm, growth of ovarian follicles, uterine cycle, fertilization, implantation, First week of development, Second week of development, bilaminar germ disc, notochord formation, trilaminar germ disc, embryonic folds, fetal membranes, placenta, umbilical cord, amniotic cavity, twinning, teratology and prenatal diagnosis.

Systemic embryology includes musculoskeletal system, body cavities. Development of CVS – formation of heart tube, cardiac loop, interatrial septum and interventricular septum, vascular development, clinical correlates, circulation before birth and after birth, clinical correlates. Development of Respiratory system – formation of lung bud, maturation of lungs, clinical correlates. Development of digestive system – divisions of gut tube, foregut, midgut rotation and derivatives of mid gut, hind gut, cloaca and its

subdivisions and derivatives, clinical correlates. Development of Urogenital system – kidney, ureter and urinary bladder, mesonephric and paramesonephric ducts and their derivatives, clinical correlates. Head and Neck - pharyngeal arches and pouches, Pharyngeal clefts, development of face, palate, Tongue, thyroid gland, Nasal cavity development and clinical correlates. Development of CNS, special senses, skin along with congenital anomalies.

Histology:

Microscopy, microtome, tissue collection, embedding and paraffin blocks preparation, serial section cutting, staining techniques, mounting the sections. Along with this museum and embalming techniques. Histology of basic tissues, blood vessels, lymphoid tissue, salivary glands, tongue, oesophagus, stomach, small intestine, large intestine, pancreas, liver, gall bladder, trachea, lung, kidney, ureter, urinary bladder, testis, epididymis, vas deferens, prostate, seminal vesicle, penis, ovary, uterus, fallopian tube, mammary gland, placenta, umbilical cord, pituitary gland, thyroid and parathyroid glands, suprarenal gland, cerebrum, cerebellum, spinal cord, retina, cornea and skin.

Regional anatomy: Gross Anatomy

Upper limb – Introduction, bones of the upper limb, pectoral region, muscles, mammary gland, applied anatomy, Axilla – Boundaries and contents, Brachial plexus, applied anatomy, Back and scapular region - muscles, intermuscular spaces, anastomosis around the scapula, Arm – compartments, muscles, nerves and vessels, Cubital fossa, Forearm – compartments, muscles, nerves and vessels, flexor retinaculum, Hand – palmar aponeurosis, spaces of the palm, muscles, nerves and vessels of the palm, joints of the upper limb with osteology, surface marking and radiology.

Lower limb – Introduction, bones of the lower limb, front of thigh – femoral triangle, Adductor canal, applied anatomy, Gluteal region - muscles, nerves and vessels, Back of the thigh – Hamstrings, Popliteal fossa, Leg - compartments, muscles, nerves and vessels,

Dorsum of foot, Sole - plantar aponeurosis, muscles, nerves and vessels of the sole, joints of the lower limb with osteology, surface marking and radiology.

Head and neck – Scalp – layers, blood supply, nerve supply, lymphatics and applied anatomy, Face – muscles of facial expression, nerve supply, blood supply, lymphatics, Deep fascia of neck, Triangles of neck, Parotid gland, Submandibular region, Cranial cavity, Orbit, Temporal fossa and Infratemporal fossa – muscles of mastication, maxillary artery, mandibular nerve and Temporo-mandibular joint, Deep dissection of neck – Thyroid gland, Deep structures of the neck, Nasal cavity, Para nasal air sinuses, Oral cavity – Tongue, Hard palate and Soft palate, Pharynx, Larynx, Ear, Eyeball, related applied anatomy, osteology, surface marking and radiology.

Neuroanatomy – Introduction, Parts of brain, Spinal cord, Forebrain – Cerebral hemispheres, Diencephalon, Midbrain, Hind brain – Pons, Medulla oblongata, cerebellum, Ventricles of brain and CSF – formation and circulation, white matter of cerebrum – corpus callosum and internal capsule in detail, Basal nuclei, corpus striatum, with clinical correlations, radiology, surface marking and applied anatomy.

Thorax – Thoracic cage, Bones, Inlet of thorax and outlet of thorax – Diaphragm, Thoracic wall – Intercostal spaces with muscles, vessels and intercostal nerves, Pleura and Lungs, Mediastinum – boundaries, subdivisions and contents, Pericardium, Heart – chambers, blood supply, nerve supply, veins of thorax, Trachea, oesophagus, thoracic duct, related applied anatomy, osteology, surface marking and radiology.

Abdomen and pelvis – Anterior abdominal wall - muscles, vessels and nerves, Inguinal canal, Rectus sheath, Male external genital organs – Testis in detail, Peritoneum, Stomach, Duodenum and Pancreas, Portal vein, Large intestine, Liver, Extra hepatic biliary apparatus, Spleen, Kidney, Suprarenal glands, Ureter, Pelvic viscera, Perineum, Pelvic diaphragm with related applied anatomy, osteology, surface marking and radiology.

Genetics – introduction, chromosomes, inheritance, karyotyping, chromosomal abnormalities, inborn errors of metabolism and genetic counselling.

Practical schedule

1. During the course – the PG students should dissect the entire human cadaver
2. They should embalm and maintain the record of embalming work done.
3. In Histology section
 - Collection of tissues, fixing, block making, section cutting; use of different types of microtomes and preparation of general and systemic slides.
 - Haematoxylin & Eosin -
 - (i) Preparation of stains.
 - (ii) Staining techniques.
 - Knowledge of light microscope and electron microscope.
 - Detailed microscopic study of all the tissues (General and Systemic slides).

Scheme of theory exam:

The examination consists of three papers, with maximum marks of 100 for each paper. Each paper will be of three hours duration.

Paper -I:

- a. General Anatomy
- b. Gross Anatomy with applied aspects

Paper - II:

- i. General & Systemic-Embryology including growth, development and Teratology
- ii. General & Systemic-Histology
- iii. Comparative Anatomy.
- iv. Anthropology.

Paper - III:

- a. Neuroanatomy
- b. Histological, museum and embalming techniques including medico legal aspects
- c. Human Genetics.

*The topics assigned to the **different** papers are given as **general guidelines**. A strict **division** of subjects may not be possible. **Some overlapping** of topics is **inevitable**. **Students should be prepared to answer the overlapping topics.**

B. Practicals - 200 marks, Gross Anatomy - 100 marks,

Histology – 100marks

i) Gross Anatomy

To dissect in 3 hours and display for discussion the allotted dissection exercise on a human cadaver.

Distribution of Marks

Surface Anatomy	=	10
Dissection	=	40
Discussion	=	50
<hr/>		
Total	=	100 marks
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ii) Histology

1. Identification and discussion of 10 stained sections which includes Neuroanatomy, Embryology and Human Genetics. 20 marks

2. i) Preparation of a paraffin block 10 marks
ii) Taking serial sections from blocks provided 10 marks
iii) Staining of the given section with H& E and discussion 20 marks

iv) Discussion on Histological techniques 40 marks

C. Viva - Voce - 100 marks

1. This includes all the components of the syllabus along with specimens, bones and embryology models and discussion on the dissertation topic submitted for the examination = 80 Marks
2. Pedagogy: Demonstration of teaching skill / techniques = 20 Marks

Maximum marks	Theory	Practicals	Viva-voce	Total
M.Sc (Anatomy) Examination	300	200	100	600

Recommended Books and Journals / Latest editions

Gross Anatomy

1. Gray's, Anatomy - 40th Edition, Elsevier 2005.
2. Last's, Anatomy - 8th Edition, ELBS, 1990.
3. Grants Method of Anatomy, 11th Editio Williams and Wilkins 1989.
4. Snell.S.Richard, Clinical Anatomy for Medical Students - 5th Edition, Little Brown and Company, 1985.
5. A.K.Datta, TextBook of Anatomy Vol. I, II & III - 4th Edition, 1997 Current Books International.
6. Keith & Moore, Clinically Oriented Anatomy - 3rd Edition, 1992 Williams & Wilkins.

Histology

1. Ham's Text Book of Histology - 9th Edition, J.B.Lippincott Company, 1987.
2. Difiore. S.H. Mariano, Atlas of Human Histoogy - 5th Edition, Lea Febiger Publishers, 1985.
3. Janqueira.C.Luis etal, Basic Histology - 2nd Edition, Large Medical Publication, 1971.
4. Drury R.A.B., Wallington E.A. Carlton's, Histological Technique - 5th Edition, Oxford University, Preces, 1980.
5. John D Bancroft, Manual of Histological Technique - Ist Edition, 1984 Churchil Livingstone.
6. Michael H Ross, Histology - A Text & Atlas - 3rd Edition, 1985 Williams & Wilkins.
7. Bloom and Fawcett, Text Book of Histology. W.B.Saunders's Company.

Embryology

1. Hamilton W.J. and Mossman H.W., Human Embryology - 4th Edition, Williams and Wilkins Company, 1972.
2. Sadler T.W., Langman's Medical Embryology - 10th Edition, Williams and Wilkins Company 1995.
3. A.K.Datta, Essentials of Human Anatomy, Human Embryology - 2nd Edition, Current Books International, 1991.
4. Larsen, Human Embryology – 4th Edition, 1997, Churchil Livingstone.

Neuro Anatomy

1. A.K.Datta, Neuroanatomy, - 1st Edition, Current Books International, 1997.
2. Snell.S.Richard, Clinical Neuroanatomy for Medical Students, - 4th Edition, Lippincott - Raven, 1982.
3. Inderbir Singh, Neuroanatomy - 5th Edition, 1997 Jaypee Brothers Medical

Publications.

Human Genetics / Medical Genetics

Emery's Elements of Medical Genetics - 9th Edition, 1995 Churchill Livingstone.

Alfred G Kudson Jr., Genetics & Disease - Mc Graw Hill Book Company N.Y.,

Thomas D. Gelehrtar, Principles of Medical Genetics - 2nd Edition, 1990 Williams & Wilkins.

J.M.Conner M A Ferguson Smith - Essentials of Medical Genetics - Blackwell Scientific Publications.

Comparative Anatomy

Banks Histology and Comparative Organology - A Text & Atlas - Edition 1974.

Wolstenhome, Taste & Smell in Vertebrates - Edition 1970.

Embryogenesis in Mammals CIBA foundation - Edition 1976.

George C. Kent, Comparative Anatomy of the Vertebrates - 3rd Edition, 1983 Mc. Graw Hill Book Company.

Romer, Vertebrate Body - 5th Edition, 1978, V.B. Saunders Company.

Physical Anthropology

Harrison, Human Biology an introduction to Human Evolution and Growth - 2nd Edition, 1970.

Poirie, Fossil Man, 1973.

Embalming Techniques

Jayavelu T., Embalming Techniques, Churchill Livingstone.

Ansari M.C., Embalming.

Embalming - Ajmani 1st edition 1998, J.P.Publishers.

Museum Techniques

Tompsett RH, Anatomical Techniques.

Edwards JJ, Medical Museum Techniques, Oxford University Press.

Journals

1. Journal of Anatomical Society of India.
2. Journal of Anatomy.
3. Acta Anatomica.
4. American Journal of Anatomy.
5. Journal of Morphology, Embryology
6. Anatomical Record
7. American Journal of Medical Genetics.

SYLLABUS FOR FINAL YEAR M.Sc (Medical) PHYSIOLOGY

I. General physiology:

Organisation of the cell and its functions
Structure of cell membrane, cell organelles
Intercellular communications
Transport across cell membrane
Membrane potentials
Body fluid compartments and changes in body fluid compartments, oedema and dehydration, osmolarity and osmolality
Homeostasis, concepts of physiological norms, range and variations
Genetic control of protein synthesis, apoptosis, programmed cell death.

II. Blood:

Composition and functions of blood
Plasma proteins – Types, normal values, origin, functions, variation in health and diseases
Red blood cells – erythropoiesis definition, sites and stages of erythropoiesis, regulation
Morphology of RBC, functions, normal values, variations, PCV and ESR, determination, anemias and its clinical significance
Haemoglobin – structure, functions, types, derivatives, methods of estimation, normal values, anemias, types and features
Life span and destruction of RBC, RE system, functions, jaundice, types
Leucocytes – leucopoiesis, sites of granulopoiesis, lymphopoiesis and monocytopoiesis
Morphology of different types of leucocytes, functions, variations, immunity, transplantation of tissues and organs
Platelets – thrombopoiesis, sites, stages, morphology, functions, normal values and variation
Hemostasis and blood coagulation – definition, clotting factors, mechanism of clotting
Clot retraction, fibrinolysis, bleeding disorders, tests for clotting, anticoagulants, actions and uses
Blood groups – ABO system and Rh factor
Blood transfusion – indications, types, reactions, lymph – origin, circulation, functions of lymph and lymph nodes, blood volume, determination, regulations

III. Nerve and muscle:

Structure of a neuron and classification of nerve fibers, properties, potential in nerve fibers, degeneration and regeneration of Nerve fibers, Neuroglia
Muscle: types, physiological anatomy of skeletal muscle
Neuromuscular junction and myasthenia gravis and NMJ blocking drugs
Mechanism of muscle contraction and its molecular basis, types of contraction – isotonic and isometric contractions
Energetics of muscle contraction – Rigor mortis
Types and properties of muscle fiber
Structure and types of smooth muscle
Contraction of smooth muscle

IV. Gastrointestinal system:

Introduction – Anatomy of GI tract, salivary secretion, types of salivary glands, innervations, composition of saliva, regulation, functions
Gastric secretion – structure of gastric mucosa, innervation, origin, composition and function of gastric juice, mechanism of secretion of HCL, functions
Regulation of gastric secretion, methods of study, phases of gastric secretion, factors influencing gastric secretion, peptic ulcer
Pancreatic secretion – structure of pancreas, innervations, composition and functions of pancreatic juice, Mechanism of secretion, regulation, tests for pancreatic exocrine function
Liver and gall bladder – function of liver, composition and functions of bile, function of gall bladder, filling and emptying, regulation, cholecystectomy, gall stones
Small intestine – structure, composition and function of succus entericus, regulation, large intestine – structure, function, secretion
Gastro-intestinal motility – stages of deglutition, mechanism, disturbances, types of movement, gastric emptying regulation
Movement of small intestine – types, regulation, ileo-caecal valve, functions, movements of colon, defecation
Gastro-intestinal hormones and their actions, digestion of carbohydrates, proteins and fats
Absorption of carbohydrates, proteins, fats, vitamins, water and electrolytes

V. Kidney, skin and temperature regulation:

Functional anatomy of kidney, renal blood flow, its determination, regulation and peculiarities
GFR – definition, measurement, filtration membrane, forces involved, control of GFR
Tubular function – reabsorption, secretion and concentration mechanism
Nerve supply to urinary bladder, micturition, Non excretory functions of kidney
Renal function tests
Skin and its functions and temperature

VI. Respiration:

Introduction – functional anatomy of respiratory tract
Pulmonary ventilation – mechanism of ventilation, muscles, pressure changes, pressure volume inter relationship, compliance, airway resistance
Surfactant – source, chemical nature, functions, lung volumes and capacities, definition, determination, normal values, significance
Alveolar ventilation – dead space, significance, pulmonary circulation, ventilation perfusion ratio and its significance
Respiratory membrane, partial pressure of gases, diffusion of gases, diffusion capacity, factors affecting diffusion of gas
Oxygen transport – forms of transport, O₂ – Hb dissociation curve, factors affecting it, myoglobin
CO₂ transport – form of transport, CO₂ dissociation curve, chloride shift, Haldane effect
Regulation of respiration – organization of respiratory centers, Non-chemical regulation, respiration and acid-base balance
Hypoxia – types, effects, voluntary hyperventilation, periodic breathing
Dyspnoea, Asphyxia, Cyanosis, Decompression sickness, Artificial respiratory methods
Pulmonary function tests, respiratory adjustments during muscular exercise

VII. Cardio vascular system:

Functional anatomy of heart, blood vessels, conducting system, systemic and pulmonary circulation
Innervation of the heart and blood vessels, VMC
Haemodynamics
Properties of cardiac muscle
Cardiac cycle
Heart rate and regulation of heart rate
Cardiac output definitions, variations, method of determination, regulation
Blood pressure
Shock
Regional circulation
Cardio vascular changes during muscular exercises

VIII. Endocrines:

Introduction to endocrinology, classification, general properties and mechanism of action of hormones
Pituitary gland – anterior pituitary hormones, their actions, control and disorders, actions, control and disorders of posterior pituitary hormones

Thyroid gland – synthesis, actions of iodine containing thyroid hormones, control of secretion, thyroid function tests and disorders

Calcium – functions, control- parathormone, calcitonin and 1-25 (OH) D -23 disorders

Endocrine pancreas – Insulin and Glucagon, source, actions, regulation, clinical disorders

Adrenal gland – adrenal cortex – nomenclature, actions, control, disorders, adrenal medullary hormones – synthesis, actions and control

IX. Reproduction:

Introductio

Male reproductive system – physiological anatomy, spermatogenesis and its regulation, testicular hormones, composition of semen

Female reproductive system – menstrual cycle, pregnancy and parturition, lactation and family planning

X. Central nervous system:

Organization of central nervous system

Synapse – transmission and properties, neurotransmitters

Receptors and properties

Sensory system – primary sensations, ascending tracts and sensory cortex

Pain sensation and thalamus

Spinal cord – reflexes

Motor tracts, basal rebellum, contral of motor ganglia, vestibular apparatus, cavity and postural reflexes

Hypothalamus, ANS, Limbic system, prefrontal lobe

Higher mental functions

Sleep and EEG

Learning and memory

Language and speech

CSF and blood brain barrier (BBB)

XI. Special senses:

Vision – functional anatomy of eye

Aqueous humour, IOP, Glaucoma

Optics of eye

Image forming mechanism

Visual activity

Errors of refractions

Retina – structure and electrical activity of photoreceptors

Visual pathway and its lesion, visual cortex, depth perception
Accommodation, dark adaptation, papillary reflexes
Colour vision with applied aspect.

Hearing – functional anatomy of ear

Physics of sound

Role of tympanic membrane, middle ear and cochlea in hearing

Auditory pathway and auditory cortex

Tests for hearing and deafness.

Taste and smell – modalities, receptors, pathways, cortical and limbic areas associated with taste and smell, olfaction and memory.

PRACTICAL SYLLABUS FINAL M.Sc (MEDICAL PHYSIOLOGY)

I. Haematology Expts, II. Amphibian Dry Expts,
III. Mammalian Expts, IV. Human and Clinical Expts

I. HAEMATOLOGY

Study of the microscope

Hemoglobin estimation and Packed cell volume estimation

Study of Haemocytometer and Red cell count

Blood indices

Rouleaux formation and Erythrocyte sedimentation rate

Behaviors of RBCs in different tonicities of sodium chloride solution and osmotic fragility

Construction of Price-Jones curve

Determination of blood groups, major and minor, cross matching, Determination of agglutinin

White cell count

Preparation and staining of a peripheral smear: Differential leucocyte count

Arneht count: sex differences in Neutrophil, Absolute Eosinophil count

Reticulocyte count

Platelet count

Laboratory tests for haemostasis: Bleeding time, clotting time, prothrombin time, clot retraction

II. AMPHIBIAN EXPERIMENTS (DRY EXPERIMENTS) Interpretation of recorded charts

A. Muscle nerve

Common electrical and mechanical appliances
Muscle – Nerve preparation
Simple muscle curve
Effect of two successive stimuli on skeletal muscle contraction
Effect of varying temperature on simple muscle curve
Effect of fatigue on muscle – nerve preparation. Demonstration of neuromuscular transmission
Determination of velocity of nerve conduction of sciatic nerve in Frog's rectum
The effect of load on the simple muscle curve
Genesis of tetanus and clonus
Recording of isometric contraction

B. Cardiovascular system

Recording of normal cardiogram in frog's heart
Effect of cold and warm saline on sinus venous and ventricle of frog's heart
Effect of 1st and 2nd stannous ligatures on frog's heart
Demonstration of all or non phenomena, treppe and summation of sublingual stimuli in Quiescent frog's heart (properties of CM)
Refractory period in a beating heart
Demonstration of the effects of stimulation of vagus and white crescentic line on the frog's heart
Fixation of autonomic pathway to the frog's heart
Perfusion of isolated frog's heart, study of the effect of ions and drugs

III. MAMMALIAN EXPERIMENTS

Isolated organ bath/perfusion studies
To study the inotropic and chronotropic functions in isolated perfused rabbit's heart
Intestinal motility (rat/rabbit): effects of various agents on the contraction of smooth muscles of intestine

IV. HUMAN AND CLINICAL EXPERIMENTS

Cardio Vascular system

Recording of arterial pulse
Sphygmomanometry
Electrocardiography
Effects of posture on BP and HR
Clinical examination of cardiovascular system

Respiratory system

Pulmonary function tests: Recording of normal spirogram, FEV, MRC, MEFR
To record chest movements by a stethograph and to study the effects of speech, swallowing, coughing, breathe holding and hyperventilation
Clinical examination of respiratory system
Artificial respiration and cardio pulmonary resuscitation(CPR)

Muscle nerve

Electromyography and its recording
Genesis of fatigue using Mosso's Ergograph

Energy balance, metabolism nutrition

Determination of BMR

Central nervous system

Clinical examination of nervous system, including cranial nerves

Scheme of theory exam:

The examination consists of three papers, with maximum marks of 100 for each paper. Each paper will be of three hours duration.

Paper -I:

General physiology
Muscle nerve
Blood and CVS

Paper - II:

Respiration
Renal physiology

GIT

Skin and Body temperature

Paper - III:

CNS

Endocrines

Reproductive physiology.

Special senses

*The topics assigned to the **different** papers are given as **general guidelines**. A strict **division** of subjects may not be possible. **Some overlapping** of topics is **inevitable**. **Students should be prepared to answer the overlapping topics.**

B. Practicals - 200 marks,

i) Haematology - 50 marks

Microscopic and non-microscopic experiments

ii. Amphibian experiments - 50 marks

iii. Mammalian experiments - 50 marks

iv. Human and clinical experiments - 50 marks

C. Viva - Voce - 100 marks

1. This includes all the components of the syllabus and discussion on the dissertation topic submitted for the examination = 80 Marks
2. Pedagogy: Demonstration of teaching skill / techniques = 20 Marks

Maximum marks M.Sc (Physiology) Examination	Theory 300	Practicals 200	Viva-voce 100	Total 600
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TEXT BOOKS

1. GUYTON (Arthur C), Text of Medical Physiology 11th Edition, 2008, Prism Publishers, Bangalore.
2. GANONG (William F), Review of Medical Physiology, 23rd Edition, and Lange.
3. VANDER ct al. Human Physiology, 8th Edition, Mechanism of body function, Mc Graw Hill Publishers.
4. CHAUDHURI (Sujith K), 5th Edition Concise Medical Physiology New Central Books, Calcutta.
5. TORTORA (Gerald J), Principles of anatomy and physiology 11th Edition John Waley & Sons, Ref. college publication.
6. GABRIEL EZIELO – Text book of Physiology, 2002., Oxford University Press
7. A.K. Jain – Textbook of Medical Physiology, 4th Edition 2008.
8. BIJLANI (RL), Understanding medical physiology; text book for medical students, Jaypee Brothers, New Delhi

REFERENCE BOOKS

1. MORAN Campbell E. J Clinical Physiology, ELBS UK Churchill 14th Edition
2. BERNE (Robert M) and LEVY (Mathew 6th Edition, Physiology Elsevier Publication 2008
3. VERNON B. MOUNT CASTLE, Vol. 1 & 2, Medical Physiology, 14th Edition, Mosby Publication.
4. PATERSON SMITH, Textbook of Physiology, 10th Edition, Smith Churchill Livingstone Publication.

Experimental Physiology

1. Ghai, A textbook of Practical Physiology, 5th Edition, Jaypee Brothers.
2. Hutchinson & Hunter, Clinical Methods 22nd Edition, Elsevier Publishers.
3. A.K. Jain – Manual of practical Physiology, 2nd Edition, Arya Publications-2007.

SYLLABUS FOR FINAL YEAR M.Sc (Medical) BIOCHEMISTRY

THEORY SYLLABUS

PAPER – I CHEMISTRY & TECHNIQUES

1. Chromatography: Principle, experimental procedure and applications of paper, thin layer, ion exchange, affinity, gel filtration, gas-liquid, HPLC.
2. Electrophoresis: Principle, experimental procedure and applications of paper, polyacrylamide gel, agarose gel and cellulose acetate.
3. Ultracentrifugation and ultrafiltration.
4. Photometry: Principle and applications of colorimetry, spectrophotometry, fluourometry, flame photometry.
5. Isotopes: Detection and measurement of radioactive isotopes. Application of isotopes in research and clinical biochemistry.
6. Ph and buffers: Concept of pH and buffers, Henderson-Hasselbalch equation. Methods of determination of pH.
7. Monoclonal antibodies, hybridoma technology, immunodiffusion, immunoelectrophoresis, radio immuno assay(RIA), enzyme linked immunosorbent assay (ELISA), fluorescent in situ hybridization (FISH) techniques.
8. Cell fractionation, biochemical activities of different fractions, marker enzymes.
9. DNA sequence determination. Recombinant DNA technique, cloning procedures, vectors, plasmids, phages, cosmids and restriction map and PCR techniques. Southern, Northern, Western blotting procedures. Restriction fragment polymorphism. In-situ hybridization. Genomic library and cDNA library. Transgenic animals and microinjection technique. Gene therapy.
- 10 Chemistry of amino acids and proteins: Structure and properties of amino acids. Protein structure and conformation. Methods to determine the amino acid sequence of proteins. Chemistry of conjugated proteins, nucleoproteins, lipoproteins, immunoglobulins, glycoproteins. Structure-function relationship of proteins- haemoglobin, myoglobin and collagen. Protein-protein interactions.
- 11 Chemistry of carbohydrates: Monosaccharides, disaccharides, polysaccharides, glycoproteins.
- 12 Chemistry of lipids: Classification, fatty acids, compound lipids, steroids.
- 13 Nucleic acids: Chemistry and structure of bases, nucleosides, nucleotides, RNA and DNA, properties of nucleic acids. Mutations, mutagens, carcinogens and in vitro mutagenesis.
- 14 Immunoglobulins: Classification, structure and functions of immunoglobulins.
- 15 Bioenergetics and biological oxidation: Concept of free energy change, high energy compounds, ATP generation, redox potential, electron transport chain, oxidative phosphorylation, inhibitors, uncouplers, ionophores.
- 16 Enzymes; Classification, nomenclature, properties of enzymes, kinetics of enzyme activity, coenzyme and cofactors, mechanism of enzyme action,

regulation of enzyme activity, enzyme inhibition, isoenzymes, proenzymes, multienzyme complexes, tandem enzymes. Purification of enzymes from cells, characterization and criteria of purity.

PAPER II – INTERMEDIARY METABOLISM

1. Methods of investigation of metabolic pathways.
2. Carbohydrate metabolism: Digestion and absorption. Glycolysis, TCA cycle, HMP shunt, uronic acid pathway, metabolism of other hexoses. Glycogen metabolism. Gluconeogenesis. Blood glucose homeostasis. Glucose tolerance test. Diabetes Mellitus. Metabolic disorders of carbohydrate metabolism.
3. Amino acid metabolism: Digestion and absorption. Deamination and urea cycle. Metabolic reactions of amino acids. Biosynthesis of non essential amino acids. Metabolism of individual amino acids. One carbon metabolism. Biologically important substances formed from amino acids. Metabolic disorders associated with amino acid metabolism.
4. Lipid metabolism: Digestion and absorption of lipids, transport and storage. Fatty acid oxidation and fatty acid biosynthesis. Biosynthesis of phospholipids, glycolipids. Metabolism of cholesterol. Metabolism of lipoproteins. Prostaglandins, synthesis and functions. Metabolic disorders associated with lipid metabolism.
5. Integration of metabolism: Hormonal regulation. Metabolism in fed state, fasting state and starvation. Inter organ pathways.
6. Purine and pyrimidine metabolism: Synthesis and degradation of nitrogen bases and nucleotides. Metabolic disorders associated with purine and pyrimidine metabolism.
7. Replication: Replication, DNA damage and repair, mutations, amplification of genes, telomeres, inhibitors of replication.
8. Transcription: Transcription, post transcriptional modifications, inhibitors of transcription.
9. Translation: Translation, genetic code, inhibitors of protein biosynthesis.
10. Muscle contraction.

PAPER III – CLINICAL CHEMISTRY & NUTRITION

1. Vitamins: Fat soluble and water soluble Vitamins – chemistry, absorption, transport, active forms, biochemical function, RDA, deficiency manifestations, toxicity.
2. Mineral metabolism: Macrominerals – sodium, potassium, chloride, magnesium, calcium, phosphorus. Trace elements – iron, copper, manganese, zinc, cobalt, molybdenum, selenium, iodine and fluoride.
3. Nutrition: Energy requirements, balanced diet, BMR, SDA, RQ, nitrogen balance, Biological value of protein, nutritional disorders, protein calorie malnutrition, Kwashiorker and Marasmus, dietary fibres.

4. Membranes: Chemical composition, structure, biological properties, functions, membrane transport systems, ion channels, endocytosis, exocytosis, defects.
5. Endocrinology: Mechanism of action of hormones, hormone receptors, signal transduction, G-proteins, second messengers, cyclic AMP, cyclic GMP, calcium, inositol triphosphate, diacyl glycerol. Biosynthesis of adrenal and thyroid hormones, thyroid and adrenal function tests and disorders.
6. Erythrocytes: Structure, metabolic pathways, haemoglobin, hemoglobinopathies, porphyries, heme biosynthesis and degradation, bilirubin metabolism, jaundice, laboratory findings in jaundice.
7. Composition of plasma in health and disease.
8. Biochemical investigations of liver, kidney and gastric functions, malabsorption disorder, inherited metabolic disorders, abnormal constituents of urine.
9. Cell biology: Cell cycle, regulation, oncogenes, tumor suppressor genes, apoptosis, tumor markers.
10. Reactive oxygen species and defence mechanisms, antioxidants and enzyme systems.
11. Diagnostic enzymology; LDH, CPK, AST, ALT, ALP, ACP, GGT, Amylase, 5' nucleotidase, etc.,
12. Acute phase proteins: Alpha 1 anti trypsin, alpha 2 macroglobulin, haptoglobin, ceruloplasmin etc.,
13. Laboratory management: Accuracy, precision, specificity, sensitivity, percentage error, quality control, precautions in handling hazardous materials.

FINAL MSc (MEDICAL BIOCHEMISTRY) – PRACTICAL SYLLABUS

General Biochemistry Practicals:

1. Estimation of amino acids by ninhydrin method
2. Estimation of protein by Lowry's method
3. Estimation of protein by Folin's method, includes preparation of Folin's reagent
4. Estimation of protein by dye binding method
5. Titration of amino acid, formal titration and pK values
6. Paper chromatography of amino acids
7. Thin layer chromatography of amino acids
8. Paper chromatography of carbohydrates
9. Thin layer chromatography of amino acids
10. Poly acrylamide gel-electrophoresis, molecular weight determination
11. Absorption spectra of phenylalanine, tyrosine and tryptophan
12. Absorption spectra of purines and pyrimidines
13. Estimation of reducing sugars – arsenomolybdate method
14. Estimation of ketohexose – fructose by resorcinol method
15. Estimation of aldohexose – glucose by iodometric method
16. Periodate oxidation of sugars
17. Estimation of amino sugars
18. Saponification number of oil
19. Iodine number of oil

20. Estimation of Vitamin C, titration method and colorimetric method
21. Amylase, effect of substrate, pH and chloride
22. Effect of pH, temperature on trypsin or chymotrypsin by caseinolytic method and determination of K_m value
23. Sephadex gel chromatography of proteins, molecular weight determination
24. Affinity chromatography, blue sepharose and albumin
25. Purification of enzyme: amylase or urease

Clinical Biochemistry Practicals:

1. Estimation of glucose by glucose oxidase method
2. Estimation of glucose by ortho toluidine method
3. Estimation of glucose by Nelson-Somogyi method
4. Estimation of blood glucose by di-nitrosalicylate method
5. Estimation of blood urea
6. Estimation of serum creatinine
7. Estimation of total cholesterol and HDL cholesterol
8. Estimation of serum proteins by BCA method
9. Estimation of total protein, albumin, A/G ratio
10. Estimation of serum calcium
11. Estimation of serum electrolytes by ISE
12. Estimation of serum bilirubin
13. Estimation of serum alkaline phosphatase
14. Estimation of serum aspartate amino transferase
15. Estimation of serum alanine amino transferase
16. Electrophoretic separation of LDH and its isoenzymes
17. Estimation of serum amylase, by Somogyi method
18. Estimation of serum iron and iron binding capacity
19. Separation of proteins by agarose gel electrophoresis
20. Separation of lipoproteins by electrophoresis
21. Estimation of serum triglycerides
22. Calculation of creatinine clearance
23. Estimation of serum cortisol by fluorimetry
24. Calculation of urea clearance
25. Arterial blood Gas analysis
26. Estimation of protein, sugar and chloride in CSF
27. Electrophoresis of normal and abnormal hemoglobins
28. Estimation of glycated haemoglobin by affinity chromatography
29. Estimation of protein in urine
30. Estimation of GGT in serum
31. Estimation of serum lipase
32. Estimation of serum inorganic phosphate
33. Estimation of nucleic acid content by UV-Visible spectrophotometry and determination of purity of the nucleic acids by spectral scanning
34. Estimation of antioxidant activity using (a) FRAP – Ferric reducing antioxidant power and (b) DPPH – 2,2-diphenyl-1-picrylhydrazyl method

35. Isolation of DNA from mammalian tissues using phenol-chloroform method and kit method (Promega/Invitrogen)
36. Design of primers using manual procedures as well as primers3 software
37. DNA amplification using PCR.

RECOMMENDED TEXT BOOKS AND REFERENCE BOOKS

Text Books

1. MURRAY (Robert.K.M), Harpers Illustrated Biochemistry. Published by Lange Medicals
2. D.M.VASUDEVAN and SREEKUMARI.S Textbook of Biochemistry for Medical students, published by Jaypee Medical Publishers, New Delhi
3. CHAMPE, HARVEY & FERRIER. Lippincott's illustrated reviews of Biochemistry. Published by Lippincott, Williams and Wilkins
4. U. SATYANARAYANA Textbook of Biochemistry published by Books and Allied (P) ltd.
5. DEBAJYOTI DAS Biochemistry. Published by Academic publishers.

Reference Books

1. CHATTERJEA & SHINDE. Textbook of Medical Biochemistry. Published by Jaypee Medical Publishers, New Delhi
2. LEHNINGER'S. Principles of Biochemistry. WH Freeman and Company, New York .
3. STRYER (Lubert), Biochemistry Published by Freeman & Co.
4. DEVLIN (Thomas M). Biochemistry with Clinical Correlations. Published by Wiley-Liss, New York.
5. BURTIS (Carl.A) & ASHWOOD (Edward.R) and Bruns (David E.). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Published by Saunders.

SYLLABUS FOR FINAL YEAR M.Sc (Medical) PHARMACOLOGY

I. General principles of pharmacology

- * Principles of pharmacokinetics and pharmacodynamics.
- * Principles of toxicology and treatment of poisoning.
- * Gene based therapy.

II. Systemic pharmacology including recent advances of drug affecting:

1. Autonomic nervous system
 - * Neurohumoral transmission
 - * Agonists and antagonist of cholinergic and adrenergic systems.
2. Cardiovascular system
 - * Cardiac electrophysiology
 - * Drugs used in ischemic heart diseases, Hypertension C.C.F, Arrhythmias and Hyperlipoproteineas
3. Renal function
 - * Physiology of urine formation.
 - * Diuretics and antidiuretics.
4. Central nervous system
 - * Neuro transmission in the central nervous system
 - * General anaesthetics
 - * Local anaesthetics
 - * Sedatives and hypnotics
 - * Antiepileptics
 - * Analgesics-opioids
non-opioids
 - * Psychopharmacological agents
 - * Drugs for CNS degenerative disorders and migrane.
5. Gastro intestinal system.
 - * Drugs for peptic ulcer
 - * Cathartics abd antidiarrhoeal agents
 - * Emetics and antiemetics.
6. Blood
 - Drugs affecting haemopoeitic system
 - * Haematinics, coagulants, anticoagulants, fibrinolytics, antiplatelets
7. Autocoids
 - * Histamine and antihistamine
 - * 5-HT and its antagonists

- * Eicosanoides
- 8. Respiratory system
 - * Drugs used for bronchial asthma and cough
- 9. Drugs affecting uterine motility.
 - * Oxytocics and tocolytics
- 10. Heavy metals and chelating agents.
 - * Lead, mercury, iron, copper and arsenic
- 11. Drugs used for immunomodulation.
 - Immunostimulants
 - Immunosuppressants.
- 12. Hormones and hormone antagonists
 - * Hypothalamic and pituitary hormones
 - * Thyroid hormones and antithyroid drugs
 - * Sex hormones and their antagonists
 - * Adrenocorticosteroids and their antagonists
 - * Antidiabetic drugs.
 - * Vit D₃
- 13. Chemotherapy of microbial diseases.
 - * Antimicrobial agents – general considerations
 - * Antimicrobial agents – sulfonamides
 - Quinolones
 - B-lactam antibiotics
 - Aminoglycosides
 - Tetracyclines, chloramphenicol
 - Macrolide antibiotics
 - Miscellaneous antibiotics
 - * Antimycobacterial agents
 - * Antifungal agents
 - * Antiviral agents
 - * Antimalarial agents
 - * Antiamoebic agents
 - * Antiprotozoal agents
 - * Drugs for helminthiasis
- 14. Chemotherapy of Neoplastic diseases.
- 15. Miscellaneous topics
 - * Basic knowledge about ethics of animal experimentation
 - * Preclinical screening for the following:
 - Antihypertensives
 - Analgesics

- Antiepileptics
- Antiulcer drugs
- Antiinflammatory drugs
- * Toxicity studies in animals
- * Clinical trials – phase I, II, III & IV
- * Bioassay: principles and methods.
- * Principles and application of biostatistics
- * Essential drug concepts
- * Drug addiction and drug abuse
- * Important interactions and their mechanisms

PRACTICAL SYLLABUS FOR M.Sc. PHARMACOLOGY

- Chemical test for alkaloids- atropine, physostigmine, pilocarpine,
Acids- salicylic acid aspirin
Glycosides- digoxin
- Bioassay for(recorded graph discussion): acetyl choline
Histamine
Oxytocin
5-HT
- Screening methods for: antiepileptic agents
Anti inflammatory agents
Motor co-ordination.

EXAMINATION PATTERN

Theory : Maximum marks for each paper 100

Paper I, II, III each of three hours duration covering the following topics.

- Paper I : general pharmacology, clinical pharmacology, screening procedures, biostatistics.
- Paper II : systemic pharmacology: ANS, CNS, CVS, GIT, Haemopoietic, renal and respiratory systems, autocooids, (including recent advances)
- paper III : Systemic pharmacology: Chemotherapy, Immunotherapy, Endocrines and Miscellaneous topics. (including recent advances)

Practical

200marks

Bioassay (recorded graph) – 50marks

Graph discussion – 50marks

Technique demonstration- 25marks

Chemical test- 25marks

Screening methods- 25marks

Antiepileptic agents

Anti inflammatory agents

Motor co-ordination

Journal club- 25marks

Viva-voce with discussion of dissertation topic - 80 marks

Pedagogy- 20 marks

BOOKS RECOMMENDED:

Sl.no	Title of the book	edition	Author(s)
01	Pharmacology and Pharmacotherapeutics	16	R.S.Satoskar. S.B.Bhandarkar S.S.Anipure H.R.Satoskar
02	Essentials of medical pharmacolgy	4	K.D. Tripathi
03	Goodman & Gillman's The pharmacological basis Of therapeutics	9	Joel G.Harman Lee E. Limbird Raymond W. Ruddon Perry B. Molinoff
04	Basic and clinical pharmacology	7	Bertram G. Katzung
05	Pharmacology	4	H.P. Rang M.M. Dale J.M. Riter
06	Clinical pharmacolgy	8	D. R. Lawrence Benett
07	Screening Methods in Pharmacology	recent	Robert turner
08	Evaluation of Drug Activities Pharmacometrics Vol. 1&2	recent	D.R. Lawrence A.L. Bacharach
09	Fundamental of Pharmacology	2	M.N.Ghosh
10	Pharmacological experiment on Isolated tissue	recent	L.M. Perry
11	Pharmacological experiment on	recent	W.L.M. Perry

	Intact preparations		
12	artindale, The complete drug reference	32	Kathleen Parfit
13	A.M.A Drug evaluation	6	American Medical association
14	Remington's Pharmaceutical sciences	18	Alfanzo R. Gennaro
15	Annual Review of Pharmacology Toxicology	Recent	
16	Avery's drug treatment	4	Spfight Holford
17	Selected topics in Experimental Pharmacology	recent	U.K.Seth N.K. Dadkar Usha G. Kamat

SYLLABUS FOR FINAL YEAR M.Sc (Medical) MICROBIOLOGY

GENERAL MICROBIOLOGY

1. History and Pioneers in Microbiology
2. Microscopy.
3. Morphology of bacteria and other microorganisms.
4. Nomenclature and classification of microbes.
5. Growth and nutrition of bacteria.
6. Bacterial metabolism.
7. Sterilization and disinfection.
8. Bacterial toxins.
9. Bacterial antagonism: Bacteriocins.
10. Bacterial genetics.
11. Gene cloning.
12. Antibacterial substances used in the treatment of infections and drug resistance in bacteria.
13. Bacterial ecology-Normal flora of human body, Hospital environment, Air, Water and Milk.
14. Host parasite relationship.

IMMUNOLOGY

1. Normal immune system.
2. Innate immunity.
3. Antigens.
4. Immunoglobulins
5. Complement.
6. Antigen-Antibody reactions.
7. Cell mediated immunity.
8. Hypersensitivity
9. Immunodeficiency
10. Auto-immunity
11. Immune tolerance
12. Immunology of transplantation.
13. Tumour immunity.
14. Prophylaxis and immunotherapy.
15. Measurement of immunity.

SYSTEMIC BACTERIOLOGY

1. Isolation, description and identification of bacteria.
2. Staphylococcus and Micrococcus: The anaerobic gram positive cocci.
3. Streptococcus and Lactobacillus
4. Neisseria, Branhamella & Moraxella
5. Corynebacterium and other coryniform organisms

6. Bacillus: The Aerobic spore bearing bacilli.
7. Clostridium: The Anaerobic spore bearing bacilli
8. Enterobacteriaceae
9. Vibrios, Aeromonas, Plesiomonas Campylobacter and spirillum
10. Haemphilus and Bordetella
11. Pasteurella and Francisella
12. Brucella
13. Mycobacteria
14. Actinomyces, Nocardia, and Actinobacillus
15. Pseudomonas
16. Spirochaetes
17. Chlamydiae
18. Rickettsiae
19. The bacteroidaceae: Bacteriodes, Fusobacterium and leptotrichia
20. Mycoplasmatales: Mycoplasma, Ureaplasma, Acholeplasma
21. Erysipelothrix and listeria
22. Chromobacterium, Flavobacterium, Acinetobacter and Alkaligens
23. Miscellaneous bacteria

VIROLOGY

1. Nature of viruses
2. Classification of viruses
3. Morphology, virus structure
4. Viral replication
5. The genetics of viruses
6. Pathogenicity of viruses
7. Epidemiology of viral infections
8. Vaccines and Anti viral drugs
9. Bacteriophages
10. Pox viruses
11. Herpes viruses
12. Vesicular viruses
13. Toga viridae
14. Flavi viridae
15. Arena viridae
16. Marburg and Ebola viruses
17. Rubella
18. Orbi viruses
19. Influenza viruses
20. Respiratory diseases: Rhinoviruses, Adenoviruses and Corona viruses
21. Paramyxiviridae
22. Enteroviruses: Polio & other enteric viruses
23. Hepatitis viruses
24. Rabies virus
25. Slow viruses

26. Human immunodeficiency viruses
27. Oncogenic viruses
28. Tetatogenic viruses
29. Viruses of gastroenteritis

PARASITOLOGY

1. Protozoan parasites of medical importance:
Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium etc.
2. **Helminths** : All those medically important heminths belonging to Cestodes, Trematode and
Nematode.

Cestode : Diphyllbothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium, Multiceps etc
Trematode : Schistosoma, Fasciola, Gastrodiscoides, Paragonimus, Clonarchis, Opisthorchis, etc.,
Nematodes : Trichuris, Trichinella, Strongyloides, Ancylostoma, Ascaris, Enterobius, Filarial worms, Dracunculus, etc.,
Ectoparasites : common arthropods and other vectors.

MYCOLOGY

1. The morphology and reproduction in fungi and antimycotic agents,
2. Classification of fungi,
3. Contaminant and opportunistic fungi
4. Superficial mycotic infections.
5. Fungi causing subcutaneous mycoses.
6. Fungi causing systemic infections.

Some of the basic topics will be taken in the Ist year

SKILLS TO ACQUIRE

BACTERIOLOGY:

1. Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Kligler iron agar, Robertson’s cooked meat, Lowenstein Jensens, Sabouraud’s, Biochemical media
2. Operation and maintenance of Autoclave, Hot air oven, distillation plant, filters like Seitz and Membrane sterility tests.
3. Washing and sterilization of glassware.
4. Preparation of reagents – oxidase, kovac, etc.,
5. Disposal of contaminated materials.
6. Testing of disinfectants – phenol co efficient test and its use.
7. Quality control of media, reagents etc.,
8. Aseptic practise in lab and safety precautions.

9. Care and maintenance of common laboratory equipments.
10. Preparation of antibiotics discs, performance of Kirby Bauer, Stokes etc., Estimation of minimal inhibitory/bactericidal concentrations by tube/plate dilution methods.
11. Tests for Beta lactamases & detection of Drug resistance in Bacteria.
12. Collection of specimens for microbiological investigations.
13. Techniques for Anaerobiosis.
14. Identification of bacteria of medical importance up to species level (except Anaerobes which could be up to generic level.
15. Preparation of stains viz, Grams, Alberts, Capsules, Spores, Ziehl Neelsens etc., and performing for staining.
16. Care and operation of microscopes viz., Dark ground, Phase contrast and Fluroscnt microscope, (Electron microscope).
17. Care and breeding of lab animals viz. Mice, Rats, Guinea pigs, Rabbits and also experiments on various laboratory animals.
18. Stock culture maintenance.

DESIRABLE TO ACQUIRE:

1. Serum antibiotic assay.
2. Phage typing of bacteria
3. Enterotoxigenecity.
4. Sero grouping to Streptococci.
5. Antibiotic susceptibility testing for Mycobacteria.

IMMUNOLOGY

1. Collection and preservation of serum.
2. Preparation of antigens.
3. Preparation of adjuvants and rising of antisera in animals
4. Performance of common serological tests.
5. Immuno electrophoresis
6. Immunodiffusion and CIEP.
7. ELISA
8. CD4, CD8 counts.

MYCOLOGY

1. Collection and processing of clinical specimens for fungi.
2. Special techniques like Woods lamp examination, hair baiting techniques, slide cultures.
3. Stock culture maintenance.

PARASITOLOGY

1. Examination of faeces for ova and cysts: Direct and concentration methods.
2. Egg counting techniques.
3. Examination of peripheral blood, urine, CSF, and other fluids for parasites.
4. Examination and identification of histopathology slides for parasitic infection.
5. Serological test for parasitic diseases.
6. Preservation of parasites.

7. Permanent staining techniques for parasites.
8. In- vitro culture for parasites, viz., Malarial parasites, Amoeba, and Ancylostoma.

VIROLOGY

1. Preparation and identification of CPE in various tissue cultures.
2. Serological tests for viral infections
3. Laboratory diagnosis for AIDS
4. Laboratory diagnosis of Hepatitis.
5. Prevention and laboratory safety measures.

METHODS OF TRAINING

Training is given under the following heading:

1. Seminars.
2. Journal clubs.
3. Animal experiments
4. Culture seminars.
5. Symposia.
6. Slide seminars.
7. Serological tests.
8. Dissertation
9. Maintenance of record book.
10. Guest lectures/Conferences/Workshops/CME.

Each candidate is posted to different sections in the department on rotation. They will be acquainted with the basic microbiology for first three months.

Final Exams- at the end of three years in MSc Microbiology

(As per University regulations)

SCHEME OF EXAMINATION:

Theory consists of 3 papers each of 100 marks	: 300 Marks
Practical conducted for 2 days	: 200 Marks
Viva- voce	: 100 Marks

Details of distribution of topics for each paper will be as follows:

- PAPER I - General microbiology and Immunology.
 PAPER II - Systemic Bacteriology and Parasitology.
 PAPER III - Mycology and Virology

PRACTICALS

Duration of examination: 2 days(as per the scheme given below) Marks: 200

The examination will consists of the following exercises conjointly conducted and evaluated by examiners (1 internals and 1 externals)

1. Exercise in clinical bacteriology.
2. Isolation and identification of bacteria from various clinical samples.
3. Exercise in bacteriological techniques.
4. Isolation and identification of bacteria from a pure culture.
5. Identification of various fungi, and slide culture.
6. Animal experiments.
7. Exercise in virology techniques.
8. Exercise in Parasitology.
9. Serology exercise in Bacteriology and Virology
10. Applied bacteriological techniques-Staining or Serology exercise
11. Immunology exercise

C. VIVA-VOCE

Marks: 100

The Viva-Voce examination consists of question on Bacteriology, Mycology, Virology, Immunology, and Parasitology topics, it will also include recent advances, history and scope of Microbiology.

1. Viva-Voce Examination: 80 Marks
2. Pedagogy: 20 marks

Students will be examined by all the examiners together about comprehension, analytical approach, expression and interpretation of data.

Maximum marks for	Theory	Practical	Viva and pedagogy	Grand Total
M.Sc.Microbiology	300	200	80+20	600

RECOMMENDED BOOKS: (LATEST EDITIONS)

Sl. No.	Title	Author	Publishers
1.	Medical Microbiology	Samuel Baron	Churchill Livingstone Inc
2.	Laboratory Diagnosis of Viral Infections	Edmin H Lennette	Newyork Marcel Dekker, Inc
3.	Manson's Tropical Diseases	Gordon Cook	London, ELBS
4.	Bergey's Manual of Determinative Bacteriology	John G Holt et al	Maryland, Williams & Wilkins
5.	Manual of Clinical Microbiology	Albert Balwows	Washington D.C, American Society for Microbiology
6.	Bailey & Scott's Diagnostic Microbiology	Ellen Jo Baron et al	Missouri, Mosby
7.	Clinical Virology	Douglas D.Richman	Newyork, Churchill Livingstone
8.	Burrows Textbook of Microbiology	Bob A Freeman	W.B.Saunders
9.	Anaerobes in Human Disease	Brian I Duerden & B.S.Drasar	Great Britain, Edward Arnold
10.	Introduction to Diagnostic Microbiology	Elmer W Koneman et al	Philadelphia, J.B. Lippincott Company
11.	Field's Virology Vol.1	Bernards N Fields et al	Philadelphia, Lippincott-Ramen
12.	Field's Virology Vol. 2	Bernards N Fields et al	Philadelphia, Lippincott-Ramen
13.	Medical Microbiology, A	Danial	London, Chruchill

	guide to Microbial Infections, Pathogenesis, Immunity, Laboratory Diagnosis and control	Greenwood et al	Livingstone
14.	Mackie & McCartney Practical Medical Microbiology	J.G.College et al	London, Chrchill Livingstone
15.	Hospital Infections	John V Bennett & Philip S Brachman	Little Brown
16.	Manual of Clinical Laboratory Immunology	Noel R Rose et al	Washington D.C, American Society for Microbiology
17.	Fundamental Immunology	William E Paul	Newyork, Raven Press