

KUHAS

DEGREE OF MASTER OF SCIENCE IN MEDICAL PHYSIOLOGY

(M.Sc MEDICAL PHYSIOLOGY)

Regulation, Scheme and Syllabus

(Updated on 31.03.2011)

The syllabus is prepared in conformation & standards of National Institute like AIIMS, Delhi & it is therefore insisted that the course be conducted only in a teaching institution attached to a hospital with research facilities and has to be taught by medical faculty.

A. General Information

I. Name of the Course - Master of Science- Medical Physiology.

2. Objectives :The candidate qualifying for the award of MSc Medical Physiology should be able to

1. Demonstrate comprehensive understanding of human body as related to physiology.

2. Plan & conduct research.

3. Organise & equip physiology laboratories

4. Organise the laboratories for various practical exercises, substitute & fabricate some of the simpler equipment for teaching purposes and

5. Handle & order for stores, draw up lists of equipments required for physiology laboratories.

3. Eligibility for admission

The Candidates seeking admission to the course should have passed any of the following courses with a minimum of 60% marks and BHMS, BAMS and BDS graduates need only 55% marks in the qualifying examination from a recognized University.

1. B.Sc. Physiology
2. B.Sc. Zoology
3. B.Sc. Biochemistry
4. B.Sc. Biophysics
5. B.Sc. MLT
6. B.Sc. Nursing
7. BPT
8. B.Sc. Biotechnology
9. B.Sc. Microbiology

4. Mode of Selection

Candidates will be selected on the basis of merit & through a competitive entrance examination / interview conducted by the University/ College.

5. Number of seats As per university norms.

6. Duration of the Course:)

Three academic years (6 Semesters). Each semester shall be of 6 months duration.

2 parts-Preliminary part of one year &Final part of 2 years.

B. Course Content & regulations .

1. Foundation course - First two semesters (1 year) will be foundation course.i.e.

Anatomy, Physiology and Biochemistry

2 Subject specialization

Second and Third year (3, 4, 5, 6 semesters) - Medical Physiology.

Course content should include basics of Research methodology & Biostatistics. Candidates have to work on a particular allotted topic for dissertation, submission of which shall be as per University regulations. Candidates will also maintain a journal by the teacher in which all the practical done by him/her is recorded. They will also be given training in teaching methodology

3 Attendance

To appear for the University examination, there should be a minimum of 80% attendance.

4. Internal Assessment

Internal assessment marks is calculated on the basis of assessment of the candidate's performance in the Sessional examinations, laboratory works, Practical records, Projects, Seminars and structured discussions. In the case of failed candidates, the internal assessment marks have to be freshly calculated before each attempt of the University examination.

5. University examinations

University examination will be conducted at the end of first year for the Foundation course (Anatomy, Biochemistry and Physiology) & at the end of third year for the subject specialization. Candidates should clear the Foundation course for eligibility for the final examination.

6. Pass mark, First class, Distinction

Minimum pass marks will be - 50% aggregate of the grand total of theory, Practical, viva & dissertation examinations. A minimum of 50% for theory (Sum of 4 University theory papers, Viva-voce and theory internal assessment) & a minimum of 50% for practical (Sum of the University practical exam, internal assessment and project work is a must. (Refer mark distribution chart below for details) Such candidates are placed in the Second class.

It is compulsory for a candidate to appear for all theory papers to be awarded a pass.

Candidates who pass all the examinations in the first attempt, securing 65% or more marks of the aggregate of the grand total of theory and practical examinations shall be declared to have passed in the First class.

Those who secure 75% or more of the aggregate marks shall be declared to have passed in the First class with distinction.

7. Summary of hours of Instruction

First year: Foundation Course

Subjects	Ist Semester (24 weeks)		2nd Semester (16 weeks)		Total (40 weeks)	
	Theory Hrs	Practical Hrs	Theory Hrs	Practical Hrs	Theory Hrs	Practical Hrs
Physiology	120	180	40	140	160	320
Biochemistry	120	48	40	32	160	80
Anatomy	80	240	60	180	140	420
Total					460	820

Second & Third Year – Medical Physiology

Semesters	Theory including Seminar, Symposium Hrs	Practicals Including Lab Postings Seminars, journal clubs tutorials etc	Total Hrs
3 rd Semester	120	600	720
4 th Semester	120	600	720
5 th Semester	120	600	720
6 th Semester	120	600	720

First year: Foundation Course

Distribution of Marks for each subject

SUBJECT	<u>THEORY</u>				<u>PRACTICAL/CLINICAL</u>			SUBJECT TOTAL	<u>AGGREGATE</u>
	Written (Max/Min) 70/28	Oral 10	Internal Assmnt Max/Min 20/8	Total (Max/Min: 100/50)	Uty Practical Max. 40/20	Internal Assmnt Max. 10/5	Total Max/M in 50/25	(Max. /Min 150/75)	Max. 450
Paper – I Anatomy	70	10	20	100	40	10	50	150	450
Paper - II Biochemistry	70	10	20	100	40	10	50	150	
Paper – III Physiology	70	10	20	100	40	10	50	150	

The duration of theory examination is three hours for each paper.

Practical examination: One day each.

Candidates who pass all the examinations in the first attempt, securing 65% or more marks of the aggregate of the University examinations and internal assessments taken together shall be declared to have passed in the First class.

Those who secure not less than 75% of aggregate marks shall be declared to have passed in the First class with distinction.

Candidates who fail in the Foundation course are allowed to continue to 3rd semester; but will have to pass the Foundation course before appearing for the final University examination in the 6th semester. If the candidate fails in one subject, he/she should write the supplementary examination in that subject only. Supplementary examination will be held at the end of next semester.

FOUNDATION COURSE IN ANATOMY PAPER I

Time allotted Theory	140 hrs
Practical	420 hrs

First Semester

Paper I Anatomy Schedule of Lecturers 80 Hrs
Practicals 240 Hrs

Anatomy theory syllabus : Orientation in systems of the bodyanatomical terminologies, structure of the cell. Types of tissues, cell cycle, division, introduction to genetics.

Systemic Anatomy

Respiratory System: embryology, parts of the system, gross and microscopic structure of lungs, applied anatomy.

Circulatory system : embryology, foetal circulation, parts, microscopic anatomy of vessels, gross and microscopic structure of heart and relations of major vessels of the heart, distribution and tributaries of major arteries and veins and applied anatomy.

Digestive system : Embryology, location, parts gross and microscopic structure, digestive glands and applied anatomy.

Reproductive system: Development of male and female reproductive systems, gross and microscopic appearance of parts of male and female systems, primary and secondary sexual organs, applied aspects.

Upper limb	12	30
Lower limb	12	30
Thorax	10	30
Head & neck	14	45
Brain	12	45
Total Hours	60	180

Text books recommended:

1. Text book of Anatomy – by IB Sing - 3 volume
2. Text book of Human Histology – Inder Bir Sing
3. Essence of Human Anatomy – A.K.Dutta – 3 volume

FOUNDATION COURSE IN BIOCHEMISTRY (INCLUDING MEDICAL PHYSICS AND MOLECULAR BIOLOGY) PAPER II

DETAILED SYLLABUS

Details of the course

Duration of the course : 2 semesters
 Total number of hours : 240

Lectures : 160
 Practicals : 80

DETAILS OF LECTURES

1. **Introduction** : structure and functions of cell, cellular organelle and biomembranes 1hr
2. **Biomolecules** **14HRS**

A. Proteins : Amino acids – classification based on structure 1hr
 Ionic properties of amino acids, isoelectric pH, buffering action of Amino acids and proteins

Structural organization of proteins – primary, secondary, tertiary and quaternary, forces involved in maintaining-Examples-Insulin, Collagen, proteins

Denaturation, coagulation, isoelectric precipitation of proteins using salt solutions, classification of proteins (colour reactions to be covered with practicals).
 Electrophoresis and chromatography-brief mention on separation techniques (details of techniques and application in practical demonstration)

B. Carbohydrates : Classification-monosaccharides: glucose, fructose, galactose and mannose. Reactions: reducing property, oxidation, reduction, isomers, anomers and epimers. Derivatives like amino sugars and deoxy sugars, Glycosidic bond
Disaccharides, lactose, sucrose, maltose, polysaccharides: Starch 2hrs

C. Lipids: definitions, classification with examples, saturated and unsaturated fatty acids, triacylglycerol. Phospholipids 2hrs
Structure and function of biomembrane 2hrs

3. Enzymes: 10HRS

Nature of enzymes, coenzymes and cofactors, classification 1hr
Mechanism of action, specify of enzymes, active site 1hr
Enzyme kinetics, factors affecting enzyme activity, Km value and significance (derivation not required) 2hrs

Enzyme inhibition – competitive, allosteric, feed back
Therapeutic agents like antimetabolites as example 2hrs

Enzymes regulation in biological systems-allosteric regulation
Covalent modification, zymogen activation induction and
Repression (mention only) 1hr

Isoenzymes and their significance with suitable examples 1hr
Clinical enzymology-diagnostic importance of enzymes
(LDH, CPK, AST, ALT, ACP, GGT, GPD, 5' Ntase, cholinesterase,
Amylase, Lipase) 2hrs

4. Digestion and absorption of nutrients – carbohydrates

Lipids and proteins: 3hrs
Disorders of digestion and absorption 1hr
Glucose transporters 1hr
Malnutritions – PEM 1hr

5. A. Metabolism of Carbohydrates 14 HRS

- i. EMP pathway: Reactions, regulation in brief, energetics, Rapaport Leubering cycle, fate of pyruvate in aerobic and anaerobic conditions, PDH reaction 3hrs
- ii. Gluconeogenesis, key enzymes, regulation and significance
Cori's cycle 1hr
- iii. Glycogen synthesis and degradation, regulation (brief), inborn Errors associated 2hrs
- iv. HMP shunt pathway, NADPH generation, Transketolase Reaction, Tissues where operating, G6PD deficiency m, Metabolic importance (non oxidative phase need not be elaborated) 2hrs

v.	Metabolism of galactose,fructose,polyol and uronic acid Pathways-inborn errors associated	2hrs
vi.	Blood glucose regulation-action of insulin, glucagons cortisol Growth hormone	1hr
vii.	Diabetes mellitus-Aetiology,biochemical abnormalities, symptoms and complications	1hr
viii.	Glycosurias-differential diagnosis of reducing sugars	1hr
ix.	GTT-procedure,criteria of normal & diabetic status, Interpretation of Graphs, glycated HB	1hr

B. Metabolism of lipids 13HRS

i.	Beta oxidation of fatty acids, transport of fatty acids across mitochondrial membrane regulation and energetics	1hr
ii.	Synthesis of fatty acids, fatty acid synthase complex, regulation,elongation and desaturation	2hrs
iii.	Formation and utilization of ketone bodies, ketoacidosis in diabetes and starvation	2hrs
iv.	Metabolism of adipose tissue, hormone sensitive lipase, action of hormones(insulin, glucagons, epinephrine and cortisol), liver adipose tissue axis, fatty liver, lipotropic factors	2hrs
v.	Cholestrol-structure synthesis (crucial intermediates only), regulation, metabolic fate, bile acids and steroids hormones-formation from cholesterol	2hrs
vi.	Transport plasma lipids, lipoproteins, metabolism, apoproteins, functions, lipids profile and dyslipidemias-diet PUFA and dietary fibre Drugs	2hrs
vii.	Eicosanoids-prostaglandins, thromboxanes and leukotrienes, structure and formation (major steps only), actions	1hr
viii.	Phospheolipids and sphingolipids – inborn errors	1hr

C. Metabolism of Amino acids 13HRS

i.	Body amino acid pool, dynamic state of body proteins interorgan transport of amino acids, nitrogen balance, glucogenic and ketogenic amino acids	1hr
ii.	Transamination (reaction only) decarboxylation, oxidative deamination, transdeamination, formation of ammonia	1hr
iii.	Metabolism of glycine, compounds synthesized, creatine and creatinine, hyperglycinemias, glutathione	2hrs
iv.	Metaboliam of sulphur containing amino acids, methionine and cysteine, transsulphuration, transmethylation reactions, formation of taurine, PAPs, excretion of sulphur, homocystinuria, cystinuriaand cystinosis	2hrs
v.	Phenyl alanine and tyrosine-metabolism, PKU and alkaptonuria synthesis of thyroid hormones, synthesis and catabolism of catacholamines, albinism, tyrosinemia	2hrs
vi.	Tryptophan-formation of NAD (important steps only), serotonin and 5 HIAA, xanthurenic acid, metatonin, formation of indicant, Hartnup's disease, branched chain amino acids – MSUD (pathway not required)	2hrs

vii. Glutamic acid, glutamine, GABA, aspartic acid, asparagines, serine, (metabolis role and compounds synthesized using these amino acids only) 2hrs

D. TCA Cycle 6HRS

- i. Reaction, regulation and energetics 1hr
- ii. Interrelation of CHO, lipid and amino acid metabolism 1hr
- iii. Anaplerotic reactions, role of TCA cycle and metabolic adaptations during fed state and starvation 2hrs
- iv. Electron transport chain- components and sites of ATP synthase, inhibitors and uncouplers, ATP phosphorylation (briefly) 2hrs

6. Haemoglobin 5HRS

- Synthesis and degradation 2hrs
- Haemoglobinopathies and thalasseмииs, porpyrias 3hrs
(brief mention only as examples in each case)

7. Vitamins 8HRS

- Classification, chemical nature (detailed structure not required), conenzyme Forms, biochemical role, sources, requirements, deficiency and toxicity of the following vitamins
- i. Vitamins A,D,K and E-free radicals 4hrs
- ii. Thiamine, riboflavin, niacin, biotin, pyridoxine, panthothenic acid 1hr
- iii. Folic acid and one carbon groups and B12 2hrs
- iv. Ascorbic acid 1hr

8. Minerals 6HRS

- Sources, requirements, absorption, biochemical role, deficiency, and Toxicity of the following minerals
- i. Calcium and phosphorus-role of PTH.1,25 DHCC and CT 2hrs
- ii. Iron, copper magnesium and anaemias 2hrs
- iii. Sodium potassium and chloride 1hr
- iv. Trace elements- Zn,FI,Se,Mn 1hr

9. Maintenance of homeostasis 6hrs

- i. Acid base regulation-acid and bases,pH,buffers Henderson-Hasselbach's equation (derivation not required), buffer capacity 1hr
- ii. Acids bases in the body, plasma buffers,respiratory and renal regulation of pH 2hrs
- iii. Acidosis and alkalosis, major causes and compensatory mechanism Anion gap, assessment of acid base status 2hrs
- iv. Fluid and electrolyte balance –distribution of body water and disorders (hormonal regulation covered in physiology) 1hr

10. Nucleic acid 23HRS

- A. i. Structure of purines, pyrimidines, nucleosides, nucleotides 2hrs
- ii. Purine: nucleotide synthesis and catabolism (synthetic pathway need not be considered in detail with names of intermediates. Only the sources of different atoms and sequence of addition) Salvage pathway and regulation, hyperuricemia and gout, Lesch Nyhan Syndrome 2hrs
- iii. Pyrimidine :nucleotide synthesis, regulation, orotic aciduria, formation of deoxy nucleotides thymidylate synthesis reaction, folic antagonist and nucleotide analogues as chemotherapeutic agents 1hr
- iv. Nucleic acids: structure of DNA, different types of DNA, mitochondrial DNA, base pairing rule, differences between types of RNA 2hrs
- B. DNA replication, DNA polymerase, DNA repair 1hr
- C. Transcription, RNA polymerase, post-transcriptional modifications, splicing inhibitors, reverse transcriptase ribozyme 2hrs
- D. Genetic code, RNA, ribosomes 1hr
- E. Translation, steps, post – translational modification, inhibitors 2hrs
- F. Regulation of gene expression, induction, repression and derepression 2hrs
- G. Recombinant DNA technology, restriction endonucleases, southern, northern and western blotting RFLP, DNA, finger printing, polymerase chain reaction, anti sense therapy, application of molecular biology in clinical situations, gene therapy 5hrs
- H. Biochemical basis of inherited disorders: Mutations, Pathogenesis of inborn in general types of mutations with examples in each, mode of inheritance

11. Immunoglobulins

Structure and functions, hyper and hypogammaglobulinemias, immune assays. AIDS monoclonal antibodies. 2hrs

12. Biochemistry of Cancer-cell cycle 5HRS

Mutagens, carcinogens, role in carcinogenesis, virus in carcinogenesis, tumor Markers and oncogenes 2hrs
Biochemical basis of environmental health and environmental toxicology, Biotransformation of xenobiotics in general and absorption, transport, effects and biotransformation. 3hrs

13. Conventional Laboratory Investigations

- i. Liver function Tests including formation of bilirubin, hyperbilirubinemia and differential diagnosis of jaundice (S.bilirubin, serum enzymes, A/G ratio, BSP test, urine tests 2hrs
- ii. Gastric function tests (pentagastrin test, total and free acidity of gastric juice, AHT and Hollander's test) and pancreatic function tests including tests for malabsorption. 2hrs

- iii. Renal function tests –clearance tests of tubular function, NPN urine analysis
2hrs
- iv. Specialized Laboratory investigations – RIA, EIA, principles of colorimetry, Blot techniques, RELP,PCR-Details
1hr
- v. Radioactivity – diagnostic, research and therapeutic applications and radiation hazards.
1hr

DETAILS OF PRACTICALS

Practicals 1 to 15 (48hrs)

Practicals 16 to 21 (32hrs)

1. Reactions of carbohydrates: Glucose,Fructose, lactose, sucrose
2. Reactions of proteins (colour reactions and precipitation)
3. Reactions of urea and uric acid
(hypobromite and specific urease test for urea and Benedict's test and Schiff's test for uric acid).
4. Identification of biochemically important compounds in given solution
5. Normal urine-organic and inorganic constituents
6. Abnormal Urine: report on abnormal urine
7. Demonstration of chromatography and diagnostic importance
8. Introduction to clinical chemistry, collection of samples, anticoagulants and preservatives, principles of colorimetry.
9. Estimation of glucose
10. Estimation of urea in serum calculation of clearance from given values of UV
11. Estimation of creatinine serum
12. Estimation of serum cholesterol – estimation of LDL cholesterol from given values of HDL and TAG, lipid profile, data interpretation.
13. Estimation of total protein and albumin-A/G ration
14. Estimation of serum alkaline phosphatase
15. Spotters – demonstration-simple instruments, graphs,tests, etc.
16. Laboratory data interpretation-liver disease, renal diseases, acid base disturbances, diabetes mellitus, lipid disorders.
17. Problem solving exercises – short history of different conditions may be given and students will be asked to suggest investigations to arrive at a diagnosis and student will be
18. Demonstration to techniques in molecular biology
19. Clinical lab posting
20. Revision.

FOUNDATION COURSE

Paper III Physiology: Theory

First semester - 120 hrs

Second semester - 40 hrs

SCHEDULE OF LECTURES

I. HAEMATOLOGY

18 Hrs.

Fluid compartments, Composition & functions of blood, Plasma proteins

Erythrocyte - Morphology, Count, Function, Erythrocyte Sedimentation rate, Osmotic fragility.

Hemoglobin, Erythropoiesis, Anemia, Polycythemia, Fate of RBC, Jaundice.

Leucocytes - Morphology, Types, normal count and variations. Properties & Functions, Leucopoiesis.

Thrombocytes- Morphology, Count, Function, Variations. Thrombopoiesis Hemostasis. Coagulation and its disorders.

Blood groups and its importance, Blood transfusion.

Blood volume, Tissue fluid and Lymph.

II CARDIOVASCULAR SYSTEM

20 Hrs

Organization of CVS, Properties of Cardiac Muscle, Origin and spread of cardiac impulse

Cardiac Cycle – Electrical and mechanical events, ECG.

Cardiac output, Measurement, regulation

Blood pressure, measurement & variation, determinants, regulation, shock.

Regional circulation- coronary, Pulmonary, Cerebral, Cutaneous.

III RESPIRATORY SYSTEM

18 Hrs

Introduction. Functional anatomy, Mechanics of ventilation, Pressure changes, volume changes, Surfactant, Compliance, Airway resistance.

Alveolar ventilation, Dead space, Ventilation perfusion ratio

Diffusion of gases, O₂ transport, CO₂ transport.

Regulation of respiration – Voluntary, Neural, Chemical. Abnormalities of respiration Hypoxia, Cyanosis, Dyspnea, Asphyxia., High altitude, Dysbarism.

IV DIGESTIVE SYSTEM

13 hrs

Functional anatomy of GI tract, Salivary secretion & its regulation.

Gastric secretion and its regulation, Peptic ulcer, pancreatic secretion, Bile & its regulation, Intestinal juice.

Mastication, Deglutition, Movements of stomach, vomiting, Movements of intestine, Defecation.

GI Hormones, Digestion & Absorption of carbohydrates, Proteins, Fat & vitamins.

V. KIDNEY, and SKIN

11 Hrs

Functional anatomy of kidney, functions of kidney, renal blood flow and its peculiarities.

Glomerular filtration rate, Definition, Measurement and factors affecting Tubular functions – Reabsorption, Secretion, Acidification, concentration and abnormalities.

Micturition – Bladder innervation, Micturition reflex and its abnormalities.

Skin - Structure, Functions, regulation of body temperature.

VI MUSCLE and NERVE

12 Hrs

Neurons and glial cells - Structure, Types, electrical property, function, degeneration and regeneration.

Muscle- Structure & Functions of skeletal muscle & smooth muscle

Neuromuscular transmission – Functional anatomy, Transmission & Clinical importance.

VII CENTRAL NERVOUS SYSTEM

32 Hrs

Organization of Nervous system. Synapse, Properties & Functions

Reflexes, Reflex action, Property ,Function.

Sensory system – Receptor, Ascending sensory pathways, Thalamus, sensory cortex

Motor System – Spinal control of Motor activity, Motor areas in Cerebral Cortex, Pyramidal & extrapyramidal tracts, Basal ganglia & Cerebellum.

Reticular formation, Higher functions of Cortex.

Autonomous nervous system

Cerebro spinal fluid

VIII SPECIAL SENSES

10 Hrs

Olfaction and gustation

Audition

Vision

IX ENDOCRINOLOGY

18 Hrs

General endocrinology

Pituitary hormones & disorders.

Thyroid hormones & its disorders

Parathyroid hormone and calcium metabolism

Adrenal cortical hormones and clinical significance

Adrenal medullary hormones.

Endocrine Pancreas

Local Hormones.

X REPRODUCTIVE SYSTEM

8 Hrs

Male Reproductive System

Female reproductive system, Lactation, Pregnancy & Contraception

PHYSIOLOGY Practicals: First semester 180 hrs

Second semester 140 hrs

SCHEDULE OF PRACTICALS

Haematology

RBC count, WBC count, Differential count

Hemoglobin estimation, ESR determination

Blood group determination, PCV, Bleeding time, clotting time. Platelet count, Eosinophil count, Reticulocyte count.

Demonstrations only

Measurement of blood pressure

Examination of sensory systems

Examination of motor system, reflexes

Examination of CVS & Respiratory system

Examination of cranial nerves

ECG

Frog muscle-nerve preparation; Muscle experiments, Heart experiments

Innovative Sessions

Tutorials, seminars, structured discussion, integrated teaching,

Formative evaluation and revision

**Foundation Courses
Scheme of Examination**

University theory single paper (3 hrs) - **70 marks**

Internal assessment theory - **20 marks**

University Practicals - **Total 40 marks**

OSPE (10 stations)	10 marks
Haematology long	20 marks
Haematology short	5 marks
Amphibian short	5 marks
Internal assessment practicals	- 10 marks
University viva	- 10 marks
Overall total.....	- 150 marks

(Model question paper attached below)

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Detailed syllabus for specialization

M.SC – MEDICAL PHYSIOLOGY (2ND AND 3RD YEAR) – THEORY & PRACTICAL SYLLABUS

The course content is distributed as follows:

Semester 3: General Physiology, Electro physiology, Muscle & Nerve,
Hematology, Gastrointestinal Physiology

Semester 4: CVS, Respiratory System, Renal Physiology, Skin & Temperature
regulation, Dissertation.

Semester 5: Endocrine System, Reproductive System, Recent advances in
Physiology. Dissertation

Semester 6: Nervous system, Special senses, Recent advances in Physiology.

There will be sessional examinations at the end of 3rd, 4th and 5th Semesters and University examination at the end of 6th Semester. There will be 4 theory papers, practicals , dissertation & viva for University Examination.

HUMAN PHYSIOLOGY – SYLLABUS

GENERAL PHYSIOLOGY –

Introduction to Physiology, morphology of cells-Structure of cell membrane with reference to ion channels, transport across cell membranes, Intercellular communication, Cell death and regeneration, Homeostasis,

Body fluid compartments: principles of measurement and normal values.

HAEMATOLOGY-

Composition, properties and functions of blood.

Plasma proteins: Types, normal values, origin, functions, applied aspects.

Red blood cells: Morphology, functions. RBC Count - Normal value, variations, determination.

Haemoglobin: Structure, types, derivatives, normal value, functions.

Life span of RBCs, destruction of RBCs, Jaundice, tissue macrophage system.

Erythropoiesis: Definition, sites, stages and regulation.

Anaemias: types and features.

Leucocytes: Morphology of different types of leucocytes, normal values, variations, Properties and functions.

Leucopoiesis: sites, stages, regulation

Platelets: Morphology, normal values, variations, properties and functions, Thrombopoiesis.

Haemostasis: Definition, mechanism. Blood coagulation: Definition, mechanisms, clot retraction, fibrinolysis, bleeding disorders, tests for coagulation, Anticoagulants: mechanism of action and uses.

Blood groups: ABO and Rh systems, blood typing, Blood transfusion: indications, precautions to be taken and complications of mismatched transfusion.

Lymph, tissue fluid, oedema.

NERVE & MUSCLE PHYSIOLOGY-

Types of neurons, Neuroglia.

Morphology of neurons, classification of nerve fibers, properties, bioelectric potentials- RMP & Action potential. Mechanisms of conduction in nerve fibers, factors affecting conduction.

Types of nerve injuries, Wallerian degeneration, regeneration of nerve fibers, factors affecting regeneration.

Classification of muscles & Morphology & properties of each type.

Mechanism of neuro-muscular transmission. Molecular mechanism of muscle contraction

Excitation contraction coupling. Electrical, chemical, mechanical & thermal changes during muscle contraction. Types of contraction. Length tension relationships.

DIGESTIVE SYSTEM-

Introduction – Functional Anatomy of G.I. Tract. Enteric nervous system

Salivary secretion. Types of salivary glands. Innervation, composition & functions of saliva, regulation.

Gastric secretion – Structure of gastric mucosa. Innervation. Origin, composition and functions 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. Innervation, composition and functions of pancreatic juice. Mechanisms of secretion, Regulation, Tests for pancreatic exocrine function.

Liver and gall bladder – Structure and functions of liver. Composition and functions of bile. Regulation of bile secretion. Functions of gall bladder.

Regulation of filling and emptying, Cholecystectomy, Gall stones.

Small intestine – Structure, Composition and functions of succus entericus.

Large intestine- Structure, functions.

Gastro-intestinal movements – Stages of deglutition, Mechanism, Disturbances, Gastric . motility. Types of movement, Regulation of gastric emptying.

. Movements of small intestine – Types, Regulation, 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.

CARDIOVASCULAR SYSTEM

Introduction, Systemic and pulmonary circulation.

Functional anatomy of heart and blood vessels.

Properties of cardiac muscle.

Conducting system of the heart, Origin and spread of cardiac impulses.

Cardiac cycle: phases, Electrical events- Electrocardiogram, mechanical events, heart sounds.

Innervation of the heart. **Heart rate** and its regulation.

Cardiac output: Definition, variations, distribution, methods of determination (using Fick's principle in detail), Regulation.

Arterial pulse.

Haemodynamics.

Blood pressure and its regulation. Applied aspects- Hypertension, Hypotension.

Shock.

Cardiovascular changes during exercise, Compensation for gravitational effects.

Regional circulation: Cerebral, Coronary, splanchnic, cutaneous. Foetal circulation.

RESPIRATORY SYSTEM

Introduction, functional anatomy of respiratory tract, **Ventilation**- mechanics-mechanism of breathing. Pressure changes, volume changes (lung volumes and capacities), pressure-volume interrelationship- compliance, work of breathing – Airway resistance.

Pulmonary & Alveolar ventilation – dead space, significance.

Pulmonary circulation (Perfusion), ventilation –perfusion ratio and its significance.

Diffusion of gases through respiratory membrane and factors affecting it.

Oxygen transport – Oxygen Dissociation Curve and factors affecting it- myoglobin.

Carbon dioxide transport: Carbon dioxide dissociation curve.

Regulation of respiration –organisation of respiratory centers, neural regulation, Hering Breur reflexes, chemical regulation. Periodic breathing. Voluntary hyperventilation, breath holding.

Hypoxia: types and effects, high altitude changes, acclimatization, decompression sickness, respiratory adjustments during muscular exercise.

Other disorders-Dyspnoea, cyanosis, asphyxia.

Principles of Artificial respiration

Pulmonary function tests.

RENAL PHYSIOLOGY, SKIN AND TEMPERATURE REGULATION

Introduction-Functional anatomy of the kidney. Function in homeostasis

Renal circulation - peculiarities, renal blood flow and its determination.

GFR: definition, factors influencing, measurement, normal value & variations.

Tubular functions. Reabsorption, secretion and concentration mechanisms. Acidification of urine, Diuretics.

Micturition- Nerve supply to urinary bladder: Micturition reflex, its higher control

Non-excretory function of kidney.

Principles of Dialysis.

SKIN AND ITS FUNCTIONS. Temperature regulation.

ENDOCRINE SYSTEM

General endocrinology,

Pituitary gland- (Anterior and posterior)- hormones, actions, regulation of secretion and abnormalities.

Thyroid gland: Hormones, synthesis, transport, actions, regulation of secretion and abnormalities.

Hormones regulating Calcium metabolism and bone physiology, Parathormone, actions and regulation of secretion. Calcitriol- Synthesis, actions and regulation.

Calcitonin: source, actions and regulation.

Hypoparathyroidism – tetany, Hyperparathyroidism.

Rickets, osteomalacia, osteoporosis.

Adrenal cortex: Structure, classification of adrenal cortical hormones, biosynthesis. Actions, regulation of secretion and abnormalities of each.

Adrenal medulla: Hormones, actions, and pheochromocytoma.

Endocrine pancreas: hormones, actions and regulation of secretion. Diabetes mellitus.

Thymus gland, pineal.

Local hormones.

Physiology of Growth & development

REPRODUCTIVE SYSTEM

Introduction.

Male reproductive system. - Physiological Anatomy, Spermatogenesis & factors influencing it, Functions of accessory sex organs .

Female reproductive system- Menstrual cycle- Phases of ovarian and uterine cycle& hormonal control Pregnancy, parturition and lactation .

Contraceptive measures in male and female.

CENTRAL NERVOUS SYSTEM

Synapse, Types, synaptic transmission, properties.

Reflexes: classification and properties.

Organisation of CNS: Cross section of spinal cord.

Sensory system: receptors, classification and properties.

Sensory pathways: Dorsal column tract, spinothalamic tracts – lateral and ventral.

Trigeminal pathway from face. Origin, course and termination and the sensations carried through each tract.

Pain sensation: Referred pain, mechanisms and examples.

Intrinsic analgesic system.

Thalamus: classifications of nuclei, connections and functions, thalamic syndrome.

Motor system: Pyramidal tract – (Corticospinal and corticobulbar tract). Origin, course and termination.

Extrapyramidal tract and function.

Upper motor neuron and lower motor neuron lesion.

Spinal cord lesions: complete section, hemisection-Effects

Tabis dorsalis, syringomyelia, subacute combined degeneration of spinal cord.

Cerebellum: functional classification, major connections, functions and effects of lesions.

Basal ganglia: components, major connections, functions and abnormalities

Reticular formation: functions.

Sleep & EEG.

Vestibular apparatus: functions.

Posture and equilibrium maintenance- basic principles

Hypothalamus: major nuclei connections and functions.

Limbic system: major connections, functions.

Cerebral cortex, areas, functions.

Higher functions of the nervous system.

CSF: formation, composition, circulation, functions and applied aspects.

Autonomic nervous system.

SPECIAL SENSES

Vision: Structure of the eye. Physiology of vision. Visual pathway

Field of vision, effects of lesion at different sites. Light reflexes and accommodation reflex-pathway. Common errors of refraction.

Dark and light adaptation. Photochemical changes. Colour vision, colour blindness.

Hearing: Structure of the ear, Components and functions of the middle ear

Structure of organ of Corti. Physiology of hearing. Auditory pathway. Theories of hearing.

Deafness. Tests of hearing.

Smell: Structure of olfactory mucous membrane and olfactory pathway

Taste: Structure of taste bud, Basic taste modalities, Taste pathway.

BIOPHYSICS (To be taken along with the relevant systems)

Physical principles of transport across cell membranes and across capillary walls.

Biopotentials, Physical principles governing flow of blood in heart & blood vessels.

Physical principles governing flow of air in air passages.

PRACTICALS

Besides specially designed PG practicals, MSc students are to perform all undergraduate practicals and also teach these practicals to the undergraduates.

I. HAEMATOLOGY EXPERIMENTS

1. Use and care of microscope
2. Microscopic examination of blood
3. ESR, PCV and Haemoglobin estimation
4. RBC count
5. Calculation of blood indices
6. WBC count
7. Differential leukocyte count
8. Determination of blood group
9. Absolute eosinophil count
10. Reticulocyte count
11. Platelet count
12. Bleeding time, clotting time

II HUMAN EXPERIMENTS

1. Recording of arterial pulse.
2. Recording of blood pressure
3. Effects of posture and exercise on blood pressure
4. Perimetry
5. Spirometry
6. Electrocardiography (ECG)
7. Clinical examination of respiratory system
8. Examination of cardiovascular system
9. Examination of sensory system
10. Examination of motor system
11. Examination of cranial nerves
12. Examination of reflexes.

EXPERIMENTS III. AMPHIBIAN EXPERIMENTS

1. Use and care of common appliances used in experimental physiology
2. Muscle-nerve preparation
3. Simple muscle curve
4. Effect of two successive stimuli
5. Effect of variation of temperature on muscle contraction
6. Fatigue
7. Velocity of nerve impulse
8. Effect of load and after load

9. Genesis of tetanus and clonus
10. Recording of normal cardiogram of frog's heart
11. Effect of cold and warm saline on sinus venosus and ventricle of frog's heart.
 12. Effect of Stannius ligatures.
 13. Properties of cardiac muscle
 14. Effect of refractory period on frog's heart
 15. Effects of vagal stimulation on frog's heart
 16. Perfusion of isolated frog's heart, study of the effects of ions and drugs.
 17. Isolated mammalian heart perfusion – effects of drugs.
 18. Intestinal movements.

Mammalian Experiments

1. Isolated Organ Bath/Perfusion studies.

To study inotropic & chronotropic functions in isolated rabbit heart.

2. Dog experiments (charts)

PRACTICAL DEMONSTRATION

1. Audiometry
2. Pulse recording using Physiograph
3. EMG
4. Pregnancy diagnosis test.(Immunological test)
5. Genesis of tetanus using Mosses Ergograph.
6. Blood Banking.
7. Bicycle Ergography.
8. Case history(for interpretation)/Spotters/Calculations/charts.
9. Clinical charts.ie.,Clinical conditions for Discussion. Eg: Cushing's Syndrome, Cretinism, Myxoedema, Grave's disease, Adrenogenital Syndrome, Tetany, Gigantism etc.

Reference Books:

1. Textbook of Medical Physiology, Guyton and Hall.
2. Review of Medical Physiology, William. F. Ganong.
3. Human Physiology ,Vander,Sherman,Luciano
4. Physiology, Robert. M. Berne, Mathew. N. Levy
5. Textbook of Human Physiology, Sarada Subramaniam.
6. Text book of Human Physiology Dr.Indu Khurana.
7. Understanding Medical Physiology, R.L. Bijilani
8. Text book of Physiology, Vol.1 and 2, Prof. A.K. Jain

9. Practical Physiology L.Prakasam reddy.
10. Physiological Basis of Medical Practice, John. B. West
11. Text book of practical physiology G K Pal

Pattern of University exam for Final MSc Medical Physiology

4 Papers (100 marks per paper) = 400

Paper I - General Physiology, Haematology, Cardiovascular system

Paper II - Physiology of Respiration, Renal Physiology, Skin & temperature regulation, Principles of Biophysics as applied to Physiology

Paper III - Nervous system, Special senses, Muscle & nerve Physiology

Paper IV- Gastro intestinal Physiology, Endocrine system, Reproductive system, Recent advances in Physiology

Mark distribution – University Exam and Internal Assessment

University Marks			Total
Theory	4 papers	100 marks each	400
Practicals	Practical 1	Long Haematology – 25	
		Short Haematology - 10	35
	Practical 2	OSPE - 10	10
	Practical 3	Clinical Physiology(System Examination,ECG,Spirometry,Physiograph,Perimetry)	25
Record			10
Viva			50
Dissertation			50
Internal Assesment	Theory		100
	Practical		50
Grand Total			750

EMBLEM

LOG BOOK

Submitted in partial fulfillment of the requirements for the award of the Master of Science in
Medical Physiology.

by

Name

Roll no:

Certificate

This is to certify that the content of the log book is a bonafide work of
.....Reg no:MSc Medical Physiology student in the
Department of Physiology,for the academic
period 20..-20..

Head of the Department

Candidate's Statement

I hereby declare that the work incorporated in the present log book is original and has not been
submitted to any other University or Institutions for the award of any degree.

Signature
Name

Biodata of the Candidate

1. Name of the candidate:
2. Register number:
3. Name of Institution/Hospital:
4. Name of University
5. Name of the course: MSc Medical Physiology
6. Duration of the course: 3yrs

Address

7. Department:

Physiology

Signature of HOD

FIRST YEAR

- Attended the foundation course
- Subjects included were: a) Medical Anatomy
 - b) Medical Biochemistry
 - c) Medical Physiology
- Appeared for all internal assessment exams both Theory and Practicals
- Appeared for First Year MSc Degree Course University Examination [Theory and Practical] in June-July

SECOND YEAR

- Attended daily lecture classes in Physiology with MBBS 20.... batch & also presented seminars, journal clubs, and group discussions & had individual topic discussions & evaluation sessions under the guidance of senior Faculty in Physiology.
- Attended classes in Biostatistics & Research Methodology in the month of February 20.....

- Search for & Selection of topic for dissertation
 - Practicals done: All Hematology, Biophysics and Amphibian experiments (as per curriculum)
 - Attended Departmental Teacher's training program in the form of
1. Helping in conducting Practical demonstrations for MBBS and BDS students.
 2. Practical supervision & conducting group discussions – all hematology and amphibian experiments for MBBS, BDS and Para medical students.
 3. Helping in conducting research and practicals for PG students. (MD)

THIRD YEAR

Weekly Schedule

1. Daily lecture class attended: _____ hours per week
2. PG training programme: Discussions, Viva and Seminars
3. Practical demonstration and supervision: _____ hours per week
4. Practicals done: Hematology, Biophysics and Amphibian experiments.
5. Dissertation work: Study designing, Ethical clearance, Data collection, Sampling, Statistical analysis and Writing up of thesis.

Hematology

- PCV
- ESR
- RBC count
- WBC count
- Differential leukocyte count
- Clotting time

- Bleeding time
- Blood grouping
- Microscopic examination of blood
- Blood indices
- Absolute eosinophil count
- Platelet count
- Reticulocyte count

Biophysics

- Perimetry
- ECG
- Physiograph
- Spirometry

Amphibian experiments

- All Nerve-muscle experiments (as per curriculum)
- All Frog heart experiments (as per curriculum)

Mammalian Experiments

Mammalian Experiments

1. Isolated Organ Bath/Perfusion studies.

To study ionotropic & chronotropic functions in isolated rabbit heart.

Clinical examinations

- Blood pressure recording
- General examination
- Examination of cardiovascular system
- Examination of respiratory system
- Examination of higher mental functions and sensory system
- Examination of motor system
- Examination of reflexes
- Examination of cranial nerves I – VI
- Examination of cranial nerves VII - XII

Seminars

- Once in a week.
- Topics belonging to a system scheduled for the semester.
- Topic presented in depth by appropriate for PGs & modulated by a faculty member.
- Cover recent advances.
- To give practice in oral presentation

Journal Clubs

- Presentation also includes Faculty members.
- Once in a week
- Highlight recent advances.
- Clinical appreciation of a research article.
- Practice oral presentation.

Dissertation

Topic:

Summary:

CME and Conferences

Details of CME, whether delegate /paper presentation

Preparation of Panel of Examiners:

From the Medical faculty coming under KUHAS

Reference Books:

1. Textbook of Medical Physiology, Guyton and Hall.
2. Review of Medical Physiology, William. F. Ganong.
3. Human Physiology ,Vander,Sherman,Luciano
4. Physiology, Robert. M. Berne, Mathew. N. Levy
5. Textbook of Human Physiology, Sarada Subramaniam.
6. Text book of Human Physiology Dr.Indu Khurana.
7. Understanding Medical Physiology, R.L. Bijilani
8. Text book of Physiology, Vol.1 and 2, Prof. A.K. Jain

9. Practical Physiology L.Prakasam reddy.
10. Physiological Basis of Medical Practice, John. B. West
11. Text book of practical physiology G K Pal

Planning of Sessional Exams

- End semester exams on theory, practicals, oral to be conducted by the dept on topics scheduled for the semester.
- Maintain record of Internal assessment
- Final semester examination to be conducted by the university.

Unifying of Evaluating System:

- Evaluation at the university level by examiners appointed by the university.

Model Question paper-Foundation Course :(Physiology)

- Q I. Essay -10 Marks.
- Q II. Essay -10 marks
- Q III. 6marks X 5 = 30
- Q IV. Short Notes 4MarksX5 = 20

**FIRST YEAR M.Sc MEDICAL PHYSIOLOGY EXAMINATION
(FOUNDATION COURSE)
MODEL QUESTION PAPER**

Time: 3 hrs

Max marks – 70

PHYSIOLOGY

Instructions :-

Draw labeled diagrams wherever necessary

Do not write anything on the question paper other than your hall ticket no on top left

- I. Describe how oxygen is transported in the blood from lungs to tissues, with the help of an oxygen haemoglobin dissociation curve (ODC). Explain the factors which shift the ODC to the right.
(5+2+3=10 marks)
- II. Define stroke volume and cardiac output giving the normal values. Discuss how stroke volume is regulated?
(4+6=10 marks)
- III Explain the following:
 - A. Water reabsorption in the renal tubules
 - B. Regulation of aldosterone secretion

- C. Changes taking place in the uterine endometrium during different phases of the menstrual cycle.
- D. Composition and functions of pancreatic juice
- E. Intrinsic mechanism of blood coagulation & name two anticoagulants used in the laboratories .

(6 marks each = 30 marks)

IV. Write short notes on:

- A. Function of Cerebellum
- B. Refractive errors of the eye and their correction
- C. Acromegaly
- D. Excitation contraction coupling
- E. Reflex action

(4 marks each = 20 marks)