

Proposed Study & Evaluation Scheme

M.Sc. (Medical Physiology)

**SGT MEDICAL COLLEGE, HOSPITAL &
RESEARCH INSTITUTE Budhera, Gurgaon - 122505**

M.Sc. (Medical Physiology)

Programme : M.Sc. (Med. -Physiology)
Duration : 3 years full time (annual system)
Medium : English

Eligibility :

- a) MBBS from MCI recognized Medical College.
- b) BDS from DCI recognized Dental College or
- c) Graduation in any related medical/science / life science field with a minimum of three years degree course including MAMS, BHMS, BPT, B Sc Nursing & B.Sc MLT from any UGC approved university.

Objectives:

The candidate qualifying for the award of M.Sc. (Physiology) should be able to:

1. Demonstrate comprehensive understanding of physiology as well as that of the applied disciplines
2. Demonstrate adequate knowledge of the current developments in medical sciences as related to Physiology
3. Teach undergraduates and postgraduates in physiology
4. Plan and conduct research
5. Plan educational programs in physiology utilizing modern methods of teaching and evaluation
6. Organize and equip physiology laboratories. learning activities & training:

Learning activities & training :

(a) Didactic teaching :-

Topics in gross anatomy, micro anatomy, embryology, neuro anatomy and genetics along with related practical sessions.

(b) Communication Skills:-

journal club. Seminars (c) Hand on experience:-

(c) Hand on experience :-

Techniques in micro anatomy, museum specimens & embalming, and experimental work.

(d) Teaching assignments :-

Taking U.G. classes, demonstrations & practical for one semester. Preparation of A.V. aids for teaching, presentations, and setting objective questions - SAQs / MCQs. Participation in symposia, seminars & workshops.

(e) Research :-

Project / thesis - Project should be submitted 6 month before the final examination.

Evaluation :-

Written and practical assessment every semester. Internal assessment tests of 25 marks each for theory & practical shall be conducted in the 1st & 2nd years of M.Sc course and 50 marks in the third year course.

University examination shall be held by the university at the end of each year which is as follow :-

At the end of 1st year - 1st university examination

Two theory papers: Duration 3 hrs, Marks 75 each = 150 Marks

Grand viva = 25 Marks

Int. Assessment = 25 Marks

Total = 200 Marks

Practical 75 & internal assessment 25 = 100

Grand Total = 300 Marks

At the end of 2nd year - 2nd university examination

Two Theory Papers : Duration 3 hrs, Marks 75=150

Grand Viva = 25

Internal Assessment : = 75

Practical Examination = 75

Internal Assessment = 25

Total = 100

Grand Total = 200+100=300

At the end of 3rd year - Final University Examination

Two Theory Papers : Duration 3 hrs, 100 Marks each = 200

Grand Viva = 50

Internal Assessment : = 25

Total (Theory) = 275

Practical = 100

Internal Assessment = 25

Total	=	125
Grand Total	=	275+125=400

Panel of Examiners:

There shall be panel of 4 Examiners; two internal & two external examiners recommended by the principle & 3pproved by the university.

Result:

Shall be prepared and declared as below: ..

- a) 50% & above separately in theory & practical pass
- b) 75% & above separated in theory & practical pass with distinction. (c) Below 50% in any theory or practical fail

Eligibility for appearing in university examination

- a) 80% Attendance in theory
85 % Attendance in Practical
- b) The candidate should attain 40% marks in the internal assessment failing which he or she will not be allowed be appear in the University examination.

Question Paper Structure:-

The question paper shall consists of 5 questions carrying equal marks, all the questions are to be attempted. Questions can be short question / answer, long question, diagrams & enumerators giving coverage the wole syllabus of that particular year.

Reappear or Supplementary Exam:-

Candidate who has been placed under reappear category shall be allowed to continue studies in the next year but he / she will have to pass the supple Examination with in 3 months after the regular examination. Failure in supple examination will cause reversion to the corresponding junior batch.

M.Sc. (Medical Physiology) Year - I

BASICS OF PHYSIOLOGY

Course

Contents 1.

Cell Physiology

Cell Structure and membrane transport, Resting Membrane Potential, Composition of ECF and ICF, Nerst Equation, Equilibrium Potential, Gibbs-Donnan membrane equilibrium,Gold man equation

2. Nerve-Muscle and Biopotential

Neuron (structure, function and classification), Neuroglia, Action Potential, Neuromuscular junction, Skeletal Muscle (structure, mechanism of contraction and relaxation), Smooth Muscle (structure, mechanism of contraction and relaxation)

3. Blood

Function and Composition, Erythrocytes, Haemoglobin, Blood groups, Leucocytes, Thrombocytes, Immunity

4. Cardiovascular System

Cardiac Muscle, Physiological anatomy of heart and conduction system, Cardiac Action Potential, Normal ECG, Cardiac cycle, Heart sounds, Cardiac output and blood pressure, Coronary circulation, Effect of exercise on cardiovascular system.

5. Respiration

Functional anatomy of the respiratory system, Mechanism of breathing, Dead space, Surfactants Dynamic and static lung volumes and capacities, Transport of oxygen and carbon dioxide, Regulation of Respiration, Cyanosis, Hypoxia, Oxygen toxicity, Effect of exercise on respiratory system.

6. Gastrointestinal Tract

Functional anatomy, Salivary glands (secretion and function of saliva, deglutition), Stomach (composition, regulation of secretion and function of the gastric juice), Liver (secretion and function of bile), Pancreas (secretion and function), Intestines, Intestinal secretion (composition and function), Movements of Intestines, Hormones of GIT

7. Excretory System

Function of kidney, Structure of nephron, Juxta glomerular apparatus, Formation of urine Counter current mechanism, Acidification of urine & role of kidney in maintenance of acid base balance, Renal function tests, Micturition & applied aspects

8. Autonomic Nervous System

Organization of the ANS, neuro-transmitters, Effect of sympathetic and parasympathetic stimuli on different organ systems

9. Central Nervous System

General organization of CNS & PNS, synapse and properties, Sensory system :(General sensations, receptors, sensory pathways, sensory areas of brain)

Motor system: muscle spindle, Golgi tendon organ, reflex arc, descending pathway (corticospinal and extra-pyramidal tracts)

Brain: Functions of: Cerebellum, thalamus, hypothalamus, basal ganglia, limbic system, reticular activating system; Higher Function: Sleep, Speech

Tone & posture, Effect of lesions; Hemiplegia, complete and incomplete of transection of spinal cord, syringomyelia, Tabes Dorsalis.

10. Special Senses

Eye (functional anatomy, refractory indices of media, rods and cones, role of vitamin A, visual pathway), Ear (structure of internal ear, mechanism of hearing), Taste (distribution and structure of taste buds and taste papillae, primary taste modalities, taste pathway), Smell (olfactory epithelium and pathway)

11. Endocrine System

Mechanism of action of hormones, Functions of the following glands: Pituitary, thyroid, parathyroid, adrenal (cortex and medulla), pancreas

12. Reproductive System

General organization of male and female reproductive systems, Male: Spermatogenesis and actions of male sex hormones, Female: Sexual cycles and actions of female sex hormones, pregnancy, parturition and lactation, Family planning.

M.Sc. (Medical Physiology) Year-I

BASICS OF PHYSIOLOGY (PRACTICALS)

Course Contents

- Study of microscope
- Preparation and staining of blood film and identification of different blood cells
- Differential leukocyte count
- Determination of blood group
- Estimation of haemoglobin
- Haemin crystal
- Determination of bleeding and clotting time
- Total leukocyte count
- Platelet count
- ESR & PCV

M.Sc. (Medical Physiology) Year-II

PHYSIOLOGY - I

Course Contents

Cell

Definition, structure of cell, organelles, and biological membranes, Transport across biological membranes, Composition of ECF and ICF, Nerst equation, equilibrium potential, Goldman equation , Gibbs-Donnan membrane equilibrium

Nerve, Muscle and Biopotential

Nerve: Structure of neuron, Classification of neuron, Properties of nerves, Neuroglia and its functions, Monophasic and biphasic action potential, Saltatory conduction, factors affecting conduction velocity, Local response, catelectrotonic and a electrotonic potentials, Strength action curve: chronaxie and rheobase, Compound action potential, Classification of nerve injury; Degeneration and regeneration, Neuromuscular junction and synapse Skeletal Muscle: Structure of skeletal muscle, contractile and regulatory protein, sarcoplasmic reticulum, Properties of muscles, Excitation and contraction coupling, Relaxation of skeletal muscle, Rigor mortis, Isotonic and isometric contraction, Length tension relationship, Oxygen debt mechanism, Fast (white) and slow (red) muscle fibers and their differences

Smooth Muscle: Structure and types of smooth muscle, Innervation of visceral and multiunit smooth muscle including neuro-transmitters, Mechanism of contraction of smooth muscles Properties of smooth muscles

Blood

Function and composition of blood, Structure of RBC, bone marrow, erythropoiesis, erythropoietin and factors regulating maturation of RBCs; Reticulocytes and their importance Haemoglobin: Structure, function, synthesis; Abnormal hemoglobins and related diseases

Fate of hemoglobin, bilirubin metabolism, jaundice and their types, Iron metabolism Anemia: Definition and classification, Polycythemia, Absolute values of blood and RBC indices Blood groups (ABO & Rh systems), Erythroblastosis fetalis, blood transfusion, adverse reaction of mismatched transfusions, Leukocyte: Structure, types, functions of different types, leucopoiesis, Platelets: Blood Coagulation, Plasma Proteins, Immunity: Definition, types, immune response, immunoglobulins

Cardiovascular System

Cardiac Muscle: Structure and function, Physiological anatomy and structure of cardiac conduction system, activation sequence and conduction velocities, Cardiac potential: fast and slow type and their ionic bases, Effect of sympathetic and para-sympathetic stimulation on SA node; Action potential, chemotransmitters and ionic basis, Principles of ECG; Evolution of unipolar and bipolar lead system, Depolarization and repolarization sequence in single cardiac muscle fiber in volume conductor and reason

for upright wave for repolarization (T wave), Einthoven triangle Einthoven law, normal ECG (wave, interval, origin and duration).

Changes in configuration of ECG in 12 leads in a normal person, vector cardiography, principle vectors and vector loop generated during cardiac cycle, Mean electrical axis, method of its calculation, right and left axis deviation, physiological and pathological conditions for axis deviation, Conduction defects in heart and their ECG appearance, Atrial and ventricular arrhythmias, Cardiac cycle, Heart sounds, arterial pulse and jugular venous pressure changes during cardiac cycle, Cardiac output, its regulation and measurement, Peripheral circulation; Organization and innervations, Flow velocity and resistance (pre-capillary and post capillary Biophysical principle applicable to blood vessels, Venous and lymphatic circulation, Regulation of peripheral circulation, Heart rate, vagal tone, regulation of heart rate, Blood pressure, factors affecting BP and determinants of blood pressure, Regulation of BP, High and low blood, pressure, shock, Circulation through different regions: cerebral, coronary, pulmonary, fetal, splanchnic. Effect of exercise on cardiovascular system, Applied aspect; Congestive cardiac failure, Shock, Hypertension.

M.Sc. (Medical Physiology) Year-II

TEACHING METHODOLOGY

Course Contents

- Challenges for teachers in Medical Education
- Teaching strategies
 - Lecture method
 - Small group teaching
 - Inquiry and problem solving methods
 - Case study
 - Team projects
 - Presentation
 - Seminar
 - Field visit
 - Simulation
 - Computer based instructions
 - Bed side learning
 - One to one teaching
 - Self directed teaching

- Preparation of lesson
- Selection of teaching methods
- Identification and review of literature
- Identification of teaching resources
- Developing teaching aids for instructional activities that link research and theory to practice
- Content development; key element of curriculum design and evaluation
- Implementation and monitoring of curriculum transaction and student's evaluation
- Student feedback: designing and implementation
- Research paper writing

M.Sc. (Medical Physiology) Year-II

Practical

List of Practical

1. Haematology Lab Practical

- Clinical Significance of DLC
- Arneith count
- Blood Typing & Cross matching
- Assessment of Anemic Patients
- Tests for Hemostasis\
- Clinical significance of TLC (Total leukocyte count) Clinical Lab Practical

2. Clinical & Human lab Practical

- Recording of normal blood pressure
- Recording of effect of posture on normal blood pressure
- Recording of effect of exercise on normal blood pressure
- Demonstration of cold pressor test
- Clinical examination of cardiovascular system
- Vitalography
- Lung function tests,
- Stethography and effect of deglutition, coughing, talking and hyperventilation on respiratory movements and determine breath holding time after normal respiration and hyperventilation
- Clinical examination of respiratory system
- Examination of abdomen

3. Amphibian Lab demonstration & Practical

- Study of apparatus and various connection used in experimental lab
- Demonstration of sciatic nerve-gastrocnemius muscle preparation and simple muscle twitch with its time relation
- Demonstration of effect of temperature on muscular contraction
- Demonstration of phenomenon of fatigue in a nerve muscle preparation
- Demonstration of effect of increasing strength of stimulus on muscular contraction
- Demonstration and determination of rate of transmission of nerve impulse
- Demonstration of effect of two successive and several successive stimuli on muscular contraction
- Demonstration of genesis of complete and incomplete tetanus
- Demonstration of effect of load on muscular contraction in free loaded and after loaded muscle

M.Sc. (Medical Physiology) Year-III

PHYSIOLOGY

Course Contents

Special Senses

The nature of receptors and modality of stimulation, the organs housing these receptors

Eye: Physiological anatomy, refractory indices of media, image formation, Diopteric power of refractory surfaces, Details structure of retina, optic disc, and macula, Photochemistry of rods and cones, adaptation of rods and cones, Photopic and scotopic vision, role of vitamin A, Electrophysiology of retina, Visual pathway and its lesions, Field of vision- peripheral vision and central vision, Acuity of vision, stereoscopic vision and color vision

Ear: Physiological anatomy of external and middle ear, Function of external ear and middle ear ossicles, impedance matching, Detailed structure of internal ear (cochlea), Transmission of sound and traveling waves hypothesis, Endolymphatic and cochlear microphonic potentials, Acoustic stimulation, auditory pathway, Bells and decibel units, Hearing disorders- conduction and neural defect, audiometry, Organs of equilibrium, Structure of utricle, saccule and semicircular canal, Stimulation mechanism of otolith organ and semicircular canal, Vestibular pathways, linear and angular acceleration, nystagmus

Smell: Location and structure of olfactory epithelium, Olfactory pathway, Odoriferous substances, Mechanisms of receptors stimulation and impulse generation, Pathway of smell, Parosmia and anosmia, olfactory hallucination

Taste: Primary taste modalities, Chemical nature of taste evoking substances, Distribution and structure of taste papillae and taste buds, Physiology of taste arousal, Taste pathway

Skin and Temperature Regulation: Structure and function of skin, Body temperature- shell and core temperature and their variation Regulation of body temperature, Anterior and posterior hypothalamus, Adaptation to cold and hot weather, Heat stroke

Endocrine System: Introduction: neurocrine, paracrine and autocrine cells, Classification of hormones, Synthesis, storage and secretion of hormones, Transport and metabolism, Regulation of secretion of hormones- neural and feed back, Mechanism of action of hormones, Hypothalamic releasing and inhibiting hormones, **Anterior pituitary hormones, Posterior hormones, Thyroid hormones, Parathyroid hormones, Adrenal cortical and adrenal medulla hormones, Pancreas (Islets of Langerhans) hormones, Pineal hormones**

Reproductive System: Physiological anatomy of male and female reproductive system, Embryological differentiation of male female reproductive organs, Karyosome, male and female chromosomes and diseases due dysjunction of sex chromosomes, Male sex hormones- secretion, transport, biological action and mechanism of action, regulation of secretion, Female hormones secretion, transport, biological action and mechanism of action, Hypophyseal- Pituitary-gonadal axis, ovarian and menstrual cycle, Physiology of pregnancy, parturition and lactation, Family planning-methods, indication and practice.

M.Sc. (Medical Physiology) Year-III

TEACHING PRACTICE

Objectives:

- Acquire competence to plan for instructions and delivery of curriculum
 - Obtain feedback both about teaching as well as student learning
 - To develop broad understanding of modern principles and procedures used in medical science education
 - Development of essential skills for practicing modern medical science teaching
- For teaching practice student shall take classes as decided and allocated by the Department. For evaluation purpose, a board of three examiners comprising of two internal and two external examiners will be appointed by the Vice Chancellor from the panel of examiners recommended by the Principal of the College. All the four examiners will assess the student separately and average of these marks shall be awarded as final marks to the student concerned. .

M.Sc. (Medical Physiology) Year-III

Practical

Course Contents

Haematology Lab Practical

- Haemoglobin
- Total red blood cell count
- Total WBC count
- DLC
- Platelet count-Direct & Indirect
- Absolute eosinophil count
- Reticulocyte count
- Osmotic fragility of RBC
- ESR and PCV
- Absolute values

Clinical & Human Lab Practical

- Examination of sensory nervous system
- Examination of motor nervous system
- Examination of cranial nerves
- I and II cranial nerve (perimetry)
- Visual acuity and color vision
- III, IV and VI cranial nerve along with light reflex and accommodation reflex
- V and VII cranial nerve
- VIII cranial nerve
- IX, X, XI, and XII cranial nerves
- NCV
- General examination of the body
- Mosso's ergography
- Electrocardiography (ECG)
- Pulmonary Function tests

Amphibian Lab Practicals

- Recording of normal cardiogram of frog's heart in situ
- Observation on extrasystole, compensatory pause and refractory period
- To observe effect of temperature on heart
- To observe the properties of heart : Stair case phenomenon, All or None Law, Extrasystole & Compensatory Pause
- To observe effect of stimulation of vagus nerve and WCL on heart
- To identify drugs by noting their action on frog's heart
- To observe the effect of ions (Na⁺, K⁺, Ca²⁺) on frog's heart

M.Sc. (Medical Physiology) Year-III

THESIS

Guidelines

Each M.Sc. Medical student will carry out research work under the supervision of a faculty member (Guide) with post-M.D./ Ph.D. teaching experience of three years or more in the subject. However, a teacher with M.D./Ph.D. degree in the subject or related subjects shall be qualified for being taken in as Co-guide.

The Guide will be allotted to each student at the commencement of second year. The student will prepare a Plan of Thesis under the supervision of the Guide, and submit it to the university within two months of commencement of second year. The university will convey approval/disapproval of the Plan within one month.

In case the Plan is disapproved, a fresh Plan must be submitted within one month. After approval of the Plan, the student will begin work on the thesis.

The progress of work will be monitored regularly by the Guide. The thesis not exceeding 100 pages typed on A4 paper on one side only in double spacing is to be submitted to the university through the Guide six months before the date of III year University examination.

It will be evaluated by a panel of examiners (2 external & 1 internal at least) approved by the Vice Chancellor. The approval of the thesis by the panel will be a pre-requisite for the candidate to appear in the written/practical examination of III year. If the thesis is returned for revision, the suggested revision must be done and the revised thesis submitted for evaluation to the examiner(s) who has / have suggested for the revision.

After approval of revised thesis, the candidate can appear in the next 3rd year examination provided the approval is received one month before the examination. If the thesis is disapproved, the entire process from submission of a new Plan to submission of Thesis is to be repeated. On approval of new thesis, the candidate can appear in the next 3rd year examination provided there is a one month gap between the receipt of approval and commencement of examination.

Note: A student is required to submit four hard copies of the thesis along with the soft copy in the prescribed format given by the college.