



## **MD Physiology**

Curriculum and Syllabus 2011

Branch Code: 21

**SRM Medical College Hospital & Research Centre**

SRM University

SRM Nagar, Kattankulathur

Kancheepuram (Dt). 603 203

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# **M.D PHYSIOLOGY**

## **PREAMBLE**

### **GOAL**

The Goal of Post Graduate Medical Education shall be to produce a competent Medical Teaching in Physiology:

- a. Who shall be aware of the contemporary advances and developments in Physiology
- b. Who shall have acquired a spirit of scientific inquiry and is oriented to the principles of research methodology and epidemiology.
- c. Who shall have acquired the basic skills in teaching the medical, dental and other paramedical professionals.

### **OBJECTIVES**

- a. Be a competent Physiologist and a role model Medical Teacher
- b. Effectively Teach Under Graduate Medical students the basic Physiological Mechanisms in health & Disease.
- c. Train & Conduct Experimental Research, as would have a significant clinical bearing.
- d. Encourage interaction with allied departments to promote integrated teaching, research and advanced laboratory investigations to support publications, paper presentations and patient care.
- e. Encourage the student to participate in student research projects of ICMR / Science & Technology, work shops, seminars, and CME programmes in the institution and outside the institution.

## **COURSE OVERVIEW**

### **DURATION OF THE COURSE**

The period of certified study and training for the Post-Graduate MD PHYSIOLOGY shall be Three Academic years.(six academic terms). The academic terms shall mean six months training period.

### **COMMENCEMENT OF ACADEMIC SESSION**

The academic session for the Post-Graduate shall commence from May 2<sup>nd</sup> of the Academic Year.

### **DATE OF EXAMINATION**

The students admitted up to May 31<sup>st</sup> of the academic year shall be registered for that academic year and shall take up their Final Third Year regular examination in April of the due year and October of the academic year after completion of 3 years.

### **NUMBER OF EXAMINATIONS**

The University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

### **ATTENDANCE**

All students joining the postgraduate training programme shall work as full time residents during the period of training, attending not less than 80% (eighty percent) of the training during each calendar year, and will be given full time responsibility, assignments and participation in all facets of the educational process.

The period of training for obtaining the degrees shall be three completed years including the period of examination.

## **Specific Learning Objectives**

The major components of the post graduate curriculum shall be:

- a. Theoretical knowledge
- b. Practical skills
- c. Training thesis – research methodology
- d. Communication skills
- e. Computer training in Word Processing, Power Point presentation & Internet Browsing.

## **THEORY**

Detailed knowledge of the principles of physiology with historical development, experimental bases and application in health & disease. This must be at the level of reading and acquiring knowledge from varied advanced text books in physiology and allied sciences including extensive reading of general medicine.

a. Knowledge of recent development as reviewed in the Physiological reviews Annual review of physiology. Hand book of physiology and other appropriate review articles in recent journals.

b. Knowledge of functional anatomy & histology relating to physiology syllabus, bio – chemistry & pharmacology essential for teaching physiology as an integrated teaching programme for students.

## **COURSE CONTENT**

### **CELL PHYSIOLOGY**

#### **STRUCTURE OF HUMAN CELL**

#### **COMPOSITION & FUNCTIONS OF CYTOPLASM**

#### **ORGANELLES – STRUCTURE & FUNCTIONS**

- Golgi apparatus
- Centrosome
- Mitochondrion
- Rough Endoplasmic Reticulum
- Smooth Endoplasmic Reticulum
- Ribosomes
- Peroxisomes
- Inclusion Bodies

#### **NUCLEUS STRUCTURE & FUNCTIONS**

- Nuclear Membrane
- Nucleoplasm
- Chromatin
- Chromosomes
- Genes
- Nucleolus

#### **CELL DIVISION**

- Mitosis
- Meiosis

#### **CELL MEMBRANE**

- Electron Microscopic structure

## **INTER CELLULAR JUNCTIONS**

- Desmosomes
- Tight Junctions
- Gap Junction

## **TRANSPORT ACROSS CELL MEMBRANE**

### **ELECTRO PHYSIOLOGY**

- Resting Membrane Potential
- Action Potential

### **PRINCIPLE'S OF PHYSICAL LAWS**

- Boyle's law
- Charle's law
- Dalton's law
- Donnavon Equilibrium
- Nernst Equation
- Gibbs –Donnan membrane equilibrium

### **RECORDING OF MEMBRANE POTENTIAL.**

### **GENETIC CONTROL OF PROTEIN SYNTHESIS, CELL FUNCTION, REPRODUCTION.**

#### **GENES IN THE CELL NUCLEUS**

- DNA code & RNA code
- Cell reproduction & Reproduction
- Cell Differentiation
- Apoptosis
- Cancer

## **GENERAL PHYSIOLOGY**

### **BODY FLUIDS**

- Extra cellular
- Intra cellular
- Determination of body fluids
- i Total body water
- ii Red cell volume
- iii Plasma volume
- iv Interstitial fluid volume

### **WATER BALANCE**

- Positive water balance
- Negative water balance
- Factors influencing water Balance

### **WATER & ELECTROLYTE BALANCE**

- Acid base balance
- Removal

### **INTERSTITIAL FLUID**

- Composition
- Functions

### **BODY FLUID COMPARTMENTS**

- Measurement of Fluid Volumes
- Osmotic Equilibrium Between ECF & ICF



**PRINCIPLES OF OSMOSIS, OSMOLARITY, OSMOLALITY, OSMOTIC  
PRESSURE, TONICITY.**

**OEDEMA**

- Definition
- Types
- Causes

**INTERNAL ENVIRONMENT**

**HOMEOSTASIS.**

**POSITIVE & NEGATIVE FEEDBACK MECHANISM.**

**MUSCLE PHYSIOLOGY**

**MUSCLE**

**STRUCTURAL ORGANIZATION OF MUSCLE**

**STRUCTURE OF A MUSCLE FIBRE**

**SARCOTUBULAR SYSTEM.**

**CLASSIFICATION OF MUSCLES.**

- Visceral smooth muscle
- Multi unit smooth muscle
- Process of excitation contraction coupling in smooth muscle
- Characteristics –Plasticity
- Latch phenomenon

## **CARDIAC MUSCLE**

### **FUNCTIONAL ANATOMY**

### **PROCESS OF EXCITABILITY AND CONTRACTILITY**

### **PROPERTIES OF CARDIAC MUSCLE**

## **SKELETAL MUSCLE**

- Composition
- Fibre types
- Electron microscopic structure
- Molecular basis of muscular contraction
- Electrical events
- Mechanical events

### **TYPES OF MUSCULAR CONTRACTION**

- Isotonic contraction
- Isometric contraction
- Thermal changes during muscle contraction

### **PROPERTIES OF SKELETAL MUSCLE**

- Contractility
- Rheobase & chronaxie
- All or non phenomenon
- Summation
- Tetanus
- Rigidity(Rigormortis)
- Effects of load
- Fatiguability, Tonicity

## **NEUROMUSCULAR JUNCTION**

- Electron microscopic structure
- Neuro muscular transmission
- End plate potential
- Neuro muscular blockers
- Electromyography
- Excitatory post synaptic potential(EPSP)
- Inhibitory post synaptic potential(IPSP)
- Action potential

## **ELECTROMYOGRAPHY**

- Muscular disorders
  - a. Peripheral nerve injuries
  - b. Myotonia
  - c. Myasthenia gravis
  - d. Motor neuron disease
  - e. Neurotrophins

## **BLOOD, LYMPH AND RETICULO ENDOTHELIAL SYSTEM**

### **COMPOSITION AND FUNCTIONS OF BLOOD**

### **PHYSICAL PROPERTIES OF BLOOD**

- Specific Gravity
- Viscosity
- Sedimentation Rate
- Haematocrit
- Fragility
- Rouleaux Formation

## **PLASMA PROTEINS**

- Classification
- Site of Formation
- Molecular Weight & Shape
- Normal Values
- Methods of Separation
- Functions
- Immunoglobulins
- Patho Physiology
- Plasmapheresis

## **RED BLOOD CELL**

- Site of Formation
- Genesis of Red Blood Cells
- Structure & Composition of Red Blood Cells
- Enzymes Present in Red Blood Cells & its Physiological role
- Variation in red blood cells size & shape
- PCV, MCV, MCH, MCHC.
- Rouleaux formation and ESR
- Erythropoiesis
- Factors influencing Erythropoiesis
- Functions of Red Blood Cells
- Life span of Red Blood Cells
- Fate of Red Blood Cells
- Polycythemia
- Effect of polycythemia on the Circulatory System

## **HAEMOGLOBIN**

- Structure & Bio synthesis of Haemoglobin
- Factors Controlling Haemoglobin Formation
- Determination of Haemoglobin in Blood
- Colour Index
- Physical properties of Haemoglobin
- Functions of Haemoglobin
- Compounds of Haemoglobin
- Haemoglobinopathies
- Degradation of Haemoglobin
- Chemistry of Bilirubin Formation & Jaundice

## **ANAEMIAS**

- Classification & Description
- Effects of Anaemia on the circulatory system

## **WHITE BLOOD CORPUSCLES**

- Classification
- Morphology and Functions of White Blood Cells
- Functional types of Lymphocytes
- Development of immune response
  - Role of humoral immunity
  - Role of cellular immunity
    - (i) Immuno Deficiencies
    - (ii) Tissue & Organ Transplant
- Arneht Index
- Development of White Blood Cells
- Factors influencing Leucopoiesis

- Variations in White Blood Cell Count
- Determination of White Blood Cell Count
- Life span & Fate of White Blood Cells
- Leukemia
- Macrophages
- Inflammation- Patho Physiology

### **PLATELETS**

- Structure & Functions of Platelets
- Development
- Variations in Platelet count
- Haemophilia, DIC
- Thrombocytopenic Purpura
- Laboratory tests in bleeding disorders

### **BLOOD VOLUME**

- Determination
- Variations in Blood Volume
- Effects of Haemorrhage
- Restoration of Blood Volume

### **BLOOD GROUPS**

- Blood Group System
- Determination of Blood Groups
- Blood Transfusion
- Indications, precautions, & hazards
- Storage of blood for transfusion.
- Cross matching
- Clinical Importance of Blood Grouping

## **HAEMOSTASIS**

- Vascular Phenomenon – Axon Reflex
- Platelet Plug Formation
- Clotting mechanism
- Role of Calcium & Vitamin K in coagulation.
- Thrombosis

## **BLEEDING DISORDERS**

- Vascular Defects
- Platelet Dysfunction
- Coagulation Defects

## **FIBRINOLYTIC SYSTEM**

- Thrombus Formation

## **ANTI COAGULANTS**

- Pharmacokinetics of anti coagulants
- Blood Coagulation Test

## **COMPOSITION AND FUNCTIONS OF LYMPH**

## **RETICULO ENDOTHELIAL SYSTEM**

- Structure and Functions of Spleen

## **DIGESTION**

## **FUNCTIONAL ANATOMY OF THE ALIMENTARY CANAL AND ASSOCIATED ORGANS CONCERNED WITH DIGESTION.**

## **INNERVATION OF THE GASTRO INTESTINAL TRACT**

## **SALIVARY SECRETION**

- Histo – Physiology of salivary glands
- Composition of saliva
- Functions
- Regulations

- Methods of study of salivary secretion
- Patho – Physiology

### **GASTRIC SECRETION**

- Histo – Physiology of Stomach
- Composition of Gastric Juice
- Functions
- Regulation
- Methods of study of Gastric Secretion
- Factors affecting Gastric Secretion
- Formation of Gastric acid, Secretion & Regulation
- Peptic Ulcer
- Effects of Gastrectomy

### **PANCREATIC JUICE**

- Histo – Physiology of Pancreas
- Composition of Pancreatic Juice
- Regulation of Pancreatic Juice
- Methods of Study
- Patho – Physiology
- Cause & Clinical Features of Acute Pancreatitis

### **HEPATO – BILIARY SYSTEM**

- Histo – Physiology of Liver, Gall Bladder & Bile Duct
- Functions of Liver
- Composition of Bile
- Functions
- Regulation of Bile Secretion
- Differences between the Hepatic & Cystic Bile



- Cholelithiasis – Formation & Effects
- Jaundice
- Applied aspects
- Gall stones
- Liver Function Tests

### **INTESTINAL SECRETIONS**

- Histo – Physiology of Small Intestine
- Composition of Succus entericus
- Functions
- Regulation of Intestinal Secretions
- Methods of Study

### **LARGE INTESTINE**

- Histo – Physiology of Large Intestine
- Function of Large Intestine
- Regulation of Large Intestine Functions

### **MASTICATION**

- Muscles of mastication
- Bolus formation

### **DEGLUTITION**

- Stages of Swallowing
- Regulation
- Disorders of swallowing

### **GASTRO INTESTINAL MOTILITY**

- Movements of Stomach
- Hunger Contraction
- Gastric Emptying

- Movements of Small Intestine
- Functions of Ileo- cecal valve
- Movements of Large Intestine
- Gastroesophageal reflux disease.
- Defaecation reflex
- Diarrhoea
- Constipation
- Steatorrhoea
- Malabsorption Syndrome

### **FOOD DIGESTION & ABSORPTION**

- Carbohydrates
- Proteins
- Fats
- Vitamins
- Minerals

### **GASTRO INTESTINAL HORMONES**

- Secretion
- Functions
- Regulation

### **METABOLISM AND TEMPERATURE REGULATION**

#### **CARBOHYDRATE METABOLISM**

- Transport of Glucose through the cell membrane.
- Release of energy from the Glucose molecule by Glycolytic pathway, Pentose phosphate pathway
- Estimation of Blood Glucose.

## **LIPID METABOLISM**

- Transport of lipids in the Body Fluids
- Fat deposits-Adipose tissue, Leptins
- Regulation of energy release from Triglycerides
- Obesity
- Applied-Atherosclerosis

Causes, Risk factors, Prevention

## **PROTEIN METABOLISM**

- Basic Properties
- Transport & Storage of Amino Acids
- Functional role of Plasma Proteins
- Hormonal regulation of Protein Metabolism

## **LIVER**

- Physiological anatomy
- Hepatic Vascular and Lymph system
- Metabolic Functions of Liver
- Measurement of bilirubin and the bile
- Jaundice.

## **DIETARY BALANCES**

- Regulation of Feeding
- Obesity-causes, treatment
- Starvation
- Vitamins-Classification, Clinical uses

## **MINERAL METABOLISM**

- Energy Metabolism
- Factors that influence Energy output

- BMR
- Temperature Regulation
- Role of Hypothalamus
- Abnormalities-Fever

## **EXCRETORY SYSTEM & SKIN**

### **GENERAL ORGANISATION OF THE KIDNEYS & URINARY TRACT**

- Structure of Nephron
- Differences between cortical & Juxta medullary nephrons
- Renal Blood supply, Peritubular capillaries, vasarecta
- Auto regulation of Renal blood flow
- Determination of Renal Blood flow

### **GLOMERULAR FILTRATION**

- Normal values
- Factors Determining Filtration
- Glomerular Capillary Filtration Coefficient
- Changes in GFR
- Measurement of GFR

### **TUBULAR REABSORPTION**

- Proximal Convoluted tubule
- Distal Convoluted tubule
- Collecting Duct
- Transport Mechanisms
- Tubular Secretion & Transport Maximum

## **CONCENTRATION OF URINE & DILUTION OF URINE**

- Counter current system
- Assessment of renal diluting and concentrating ability
- Acidification of Urine.

## **PHYSIOLOGY OF ACID –BASE BALANCE**

- Acids & bases
- Maintenance of Blood pH

## **REGULATION OF EXTRACELLULAR FLUID OSMOLARITY & SODIUM CONCENTRATION**

- Free water & osmolar clearances
- Osmoreceptor –ADH Feedback System
- Renal regulation of electrolytes

## **REGULATION OF ACID-BASE BALANCE**

- Buffer system
- Acid-Base Disorders & Treatment
- Metabolic acidosis
- Metabolic alkalosis
- Respiratory acidosis
- Respiratory alkalosis.

## **CLINICAL MEASUREMENTS & ANALYSIS OF ACID-BASE DISORDERS.**

- Uses of Acid –Base Nomogram for Diagnosis
- Use of Anion Gap to diagnose Acid-Base Disorders.

## **JUXTA – GLOMERULAR APPARATUS**

- Renin – Angiotensin System
- Non – Excretory Functions of Kidney.

## **STRUCTURE AND INNERVATION OF URINARY BLADDER**

- Filling & emptying of the bladder
- Micturition Reflex
- Cystometrogram
- Bladder Dysfunction
  - i. Nocturnal Enuresis
  - ii. Neurogenic Bladder
  - iii. Over flow incontinence
- Diuretics

## **RENAL FUNCTION TESTS**

- Fick Principle
- Clearance Methods
  - i. Inulin
  - ii. PAH
  - iii. Creatinine
- Radiology & renal imaging

## **RENAL DYSFUNCTION**

- Renal Failure
- Dialysis
- Renal Transplant

## **ENDOCRINOLOGY**

### **INTRODUCTION TO ENDOCRINE GLANDS**

### **METHODS OF STUDY OF ENDOCRINE GLANDS**

- Effects of Extirpation

## **MEASUREMENT OF HORMONES**

- Bioassays
- Immunoassays
- ELISA-Enzyme-Linked Immunosorbent Assay

## **PROPERTIES OF HORMONES**

- Feed back mechanisms.

## **NEURAL CONTROL OF ENDOCRINE SECRETIONS**

## **MODE OF ACTION OF HORMONES**

- Receptor mechanism

## **DEVELOPMENT, GROSS ANATOMY & HISTOLOGY**

- Anterior pituitary gland
- Intermediate lobe
- Posterior pituitary gland

## **HYPOTHALAMO – HYPOPHYSEAL PORTAL SYSTEM**

## **HYPOTHALAMIC RELEASING FACTORS**

## **ANTERIOR PITUITARY GLAND**

- Hormones secreted
- Actions of hormones
- Regulation
- Disorders

## **POSTERIOR PITUITARY GLAND**

- Hormones released
- Actions of hormones
- Regulation
- Disorders-SIADH, Diabetes insipidus.

## **THYROID GLAND**

- Gross anatomy, Blood supply and histology
- Biosynthesis, storage, actions & Regulation of thyroid hormones
- Disorders
- Thyroid function Tests
- Anti – Thyroid drugs

## **PARATHYROID GLAND**

- Gross anatomy & Histology
- Chemistry, Secretion, Action & regulation of parathyroid hormones.
- Calcitonin secretion, action & regulation
- Disorders of parathyroid gland
- Calcium homeostasis
- Bone Physiology
- Applied-Metabolic Bone Diseases.
- Physiology of the teeth
- Mineral exchange in teeth & abnormalities

## **ADRENAL GLAND**

- Adrenal cortex
- Gross anatomy
- Biosynthesis, Secretions, actions and regulation of adreno cortical hormones
- Disorders of adreno cortical hormones

## **ADRENAL MEDULLA**

- Biosynthesis, Secretion, actions & regulation of adrenal medullary hormones
- Comparative physiological actions of adrenaline & nor adrenaline



- Catecholamines blocking agents
- Adrenal medullary hormones disorders

### **ENDOCRINE PANCREAS**

- Gross anatomy & histology of endocrine pancreas
- Chemistry, secretion, action & Regulation of Insulin Glucagon & Somatostatin.
- Applied Aspects-Diabetes mellitus, Hypoglycemia

### **THYMUS GLAND**

- Functional Anatomy
- Functions

### **PINEAL GLAND**

- Functional Anatomy
- Functions

### **LOCAL HORMONES**

- Site of secretion, chemistry, actions of
  - a. prostaglandins
  - b. Serotonin
  - c. Histamine
  - d. Adenosine derivatives
  - e. Plasma poly peptides
  - f. Other local hormones produced in blood & tissues

# REPRODUCTIVE PHYSIOLOGY

## MALE REPRODUCTIVE SYSTEM

- Gross anatomy & Histology of the testis
- Spermatogenesis & structure of spermatozoa
- Testosterone site of production, chemistry, actions & regulation
- Applied-Cryptorchidism
- Pubertal changes in male
- Extirpation of testis
- Cryptorchidism

## FEMALE REPRODUCTIVE SYSTEM

- Functional anatomy of the uterus & appendages
- Histology of the endometrium & ovary
- Menstrual cycle
- Pubertal changes in female
- Disorders of puberty.

## FEMALE REPRODUCTIVE SYSTEM

- Chemistry, secretion, action of hormones
- Hormonal control of ovulation
- Effects of extirpation of ovaries
- Menstrual disorders

## FAMILY PLANNING METHODS

- Male-Spacing methods, Terminal methods
- Female-Spacing methods, Terminal methods, Pregnancy vaccines.

## **PHYSIOLOGY OF PREGNANCY**

- Maternal changes during pregnancy
- Placental hormones
- Tests for pregnancy
- Foeto – placental unit

## **PHYSIOLOGY OF PARTURITION**

### **MECHANICS OF PARTURITION**

### **CONTROL OF PARTURITION-HORMONAL,MECHANICAL FACTORS.**

- Fetal and Neonatal Physiology
- Growth & Functional development of fetus
- Adjustments of infant to intrauterine life
- Special functional problems in the Neonate respiratory,GIT,Endocrine system
- Special problems of Prematurity
- Growth and development of the child.

## **PHYSIOLOGY OF LACTATION**

- Gross anatomy & Histology of the mammary gland
- Composition of milk
- Regulation of Lactation

## **GENETICS**

- Human chromosomes
- Sex determination
- Sex differentiation
- Genetic abnormalities
  - i. Chromosomal abnormalities
- Hormonal abnormalities

## **RESPIRATORY SYSTEM**

### **FUNCTIONAL ANATOMY**

- Respiratory passage and epithelial lining
- Tracheo bronchial tree and bronchial muscles
- Divisions of the lung – Broncho pulmonary segments
- Alveolar capillary membrane
- Respiratory unit

Non respiratory functions of respiratory system.

### **MECHANICS OF RESPIRATION**

- Mechanism of Breathing
  - i. Muscles of Inspiration & Expiration
  - ii. Enlargement of thoracic cage
  - iii. Intrapleural and intra pulmonary pressure during ventilation
  - iv. Lung compliance
- Airway resistance
- Work of Breathing

### **SURFACTANT**

- i. Site of production
- ii. Chemistry
- iii. Principle of surface tension
- iv. Functions of surface tension
- v. Deficiency disorders

## **PULMONARY VOLUMES & CAPACITIES**

- Normal values
- Determination
- Respiratory minute volume
- Clinical significance of pulmonary volumes & capacities

## **PULMONARY CAPILLARY DYNAMICS**

- Peculiarities of Pulmonary circulation
- Regulation of Pulmonary blood flow-Neural,Chemical control.
- Bronchial circulation
- Lymphatic circulation
- Alveolar Ventilation –Perfusion Ratio
- Effects of gravity on VA/Q
- Effects of alterations in VA/Q

## **DEAD SPACE**

- Definition
- Anatomical dead space
- Physiological dead space
- Measurement of dead space
- Clinical significance of dead space

## **PRINCIPLES OF GAS EXCHANGE**

- Diffusion & partial pressure of gases
- Molecular basis of gas diffusion
- Partial pressure of gases
- Vapour pressure
- Diffusion of gases through fluids & Tissues
- Kinetics of gases

- Principal gas laws
  - i. Boyle's law
  - ii. Avagadro's number
  - iii. Charles' law
  - iv. Dalton's law
  - v. Henry's law

### **COMPOSITION OF**

- Atmospheric air
- Alveolar air
- Expired air

### **METHODS OF RESPIRATORY GAS ANALYSIS**

- Haldane & priestly method
- Haldane method

### **OXYGEN TRANSPORT IN THE BLOOD**

- Modes of oxygen carriage
- Oxygen dissociation curve
- Factors influencing oxygen dissociation curve
- Concept of p50 & its significance
- O<sub>2</sub>-Hb dissociation curve of fetal haemoglobin
- Bohr effect

### **CARBON DIOXIDE TRANSPORT IN THE BLOOD**

- Modes of carbon dioxide carriage
- Factors influencing carbondioxide Dissociation
- Chloride shift phenomenon
- Respiratory Quotient.

## **REGULATION OF RESPIRATION**

- Respiratory Centres
- Nervous regulation
- Chemical regulation
- Effects of Hyperventilation
- Effect of sleep on respiration.

## **HYPOXIA**

- Definition & Classification
- Dyspnoea, Apnoea, Breath holding
- Periodic Breathing
- Caisson's Disease
- Cyanosis
- Asphyxia
- Carbonmonoxide poisoning
- Oxygen Therapy
- Hyperbaric Oxygen Therapy
- Oxygen Toxicity

## **RESPIRATORY INSUFFICIENCY**

- Useful methods for studying respiratory abnormalities
- Study of Blood Gases & Blood pH
- Measurement of Maximum Expiratory Flow

## **PULMONARY ABNORMALITIES**

- Chronic Pulmonary Emphysema
- Pneumonia
- Atelectasis
- Asthma
- Tuberculosis

## **HIGH ALTITUDE PHYSIOLOGY**

- Hypoxia at high altitude
- Physiological compensatory responses to high altitude hypoxia

## **PHYSIOLOGY OF HIGH ATMOSPHERIC PRESSURE**

- Physiological problems under depth
- Physiological problems of ascent-Decompression sickness,Air embolism
- Physiology of Deep-Sea Diving
- SCUBA Diving
- Hyperbaric Oxygen Therapy
- Exercise Physiology (Sports Physiology)
- Strength, Power, & Endurance of muscles
- Oxygen consumption during exercise
- Oxygen deficit & Oxygen debt
- Cardiovascular responses to exercise
- Respiratory responses to exercise
- Effects of Training
  - i. On Cardiovascular system
  - ii. On Respiratory system



iii. On Skeletal muscles

- Metabolic effects
- Drugs and Athletes.

## **AVIATION PHYSIOLOGY & SPACE PHYSIOLOGY**

- Effects of acceleratory forces on the body in Aviation & Space Physiology
- “Artificial Climate” in the sealed Spacecraft.
- Weightlessness in Space

## **ARTIFICIAL RESPIRATION & CARDIOPULMONARY RESUSCITATION LUNG FUNCTION TESTS**

- Classification
- Ventilatory function tests
- Tests of diffusion
- Blood Gas Analysis.

## **CARDIO VASCULAR SYSTEM**

### **CARDIAC MUSCLE**

- Structure
- Properties
- Resting membrane & action potential
- Excitation –contraction coupling phenomenon
- Process of cardiac muscle contraction.

## **SPECIAL JUNCTIONAL TISSUES, ORIGIN & SPREAD OF CARDIAC IMPULSE**

- Pacemaker potential

## **CARDIAC CYCLE**

- Mechanical events
- Pressure – volume changes during cardiac cycle
- Heart sounds
- Phono Cardiogram
- Valvular lesions
- Murmurs
- Frank – starling law

## **ELECTROCARDIOGRAM**

- Recording of ECG
  - i. ECG Leads
  - ii. Interpretation of ECG waves
  - iii. Clinical applications of ECG
  - iv. Recording Electrical Potentials from a partially depolarized mass of syncytial cardiac muscle.
  - v. Vectorcardiogram
  - vi. Axis Deviation
  - vii. Abnormal Sinus Rhythms
  - viii. Heart Block
  - ix. Fibrillation
  - x. Arrhythmias
  - xi. Cardiac failure

## **JUGULAR VENOUS PULSE**

- Examination & significance of waves

## **RADIAL PULSE**

- Rate, rhythm, volume, character & correlation with diseases.

## **HEART RATE**

- Factors affecting heart rate
- Control of heart rate

## **CARDIAC OUT PUT**

- Definition
- Normal Values
- Stroke volume
- Minute volume
- Cardiac Index
- Distribution of cardiac output
- Factors affecting cardiac output
- Regulation
- Heart –lung preparation.
- Determination
- Methods of measuring Cardiac Output

Using Oxygen Fick Principle

Using Ultrasonic Flowmeter

Indicator dilution method.

## **DYNAMICS OF CIRCULATION**

### **HAEMODYNAMICS**

General principles governing blood flow

Blood flow-types, measurement and distribution

Pressure & Flow in various segments of Systemic Vascular Tree

Microcirculation

Lymphatic circulation

Venous circulation

## **BLOOD PRESSURE**

- Definitions
- Measurement of blood pressure
- Determinants of Blood pressure
- Factors affecting blood pressure
- Regulation

## **HYPERTENSION**

- Causes
- Effects
- Control

## **CARDIAC SHOCK**

- Types of shock
- Description
- Treatment

## **CARDIAC RESERVE**

- Dynamics of circulation in cardiac failure.
- Quantitative Graphical Method for Analysis of Cardiac Failure

## **CARDIAC FUNCTION TESTS**

### **HEART VALVES & HEART SOUNDS**

### **DYNAMICS OF VALVULAR & CONGENITAL HEART DEFECTS.**

### **CARDIOVASCULAR RESPONSE TO MUSCULAR EXERCISE.**

### **SPECIAL FEATURES OF CARDIAC MUSCLE METABOLISM**

### **APPLIED-MYOCARDIAL INFARCTION**

- Stages of recovery from myocardial infarction
- ECG changes
- Treatment of coronary disease

## **REGIONAL CIRCULATION**

### **CORONARY CIRCULATION**

- Anatomy
- Pressure Gradient and flow
- Methods of Measurement
- Determinants of Coronary Blood Flow
- Factors Influencing Coronary Circulation
- Regulation

### **APPLIED ASPECTS**

- Coronary Thrombosis
- Myocardial Infarction
- Angina Pectoris

### **CEREBRAL CIRCULATION**

- Circle of willis
- Blood Brain Barrier
- Determination
- Regulation

- Rule of Intra Cranial Pressure
- Monroe Kellie Doctrine
- Cushing Reflex

### **CUTANEOUS CIRCULATION**

- Triple Response

### **PULMONARY CIRCULATION**

- Pulmonary oedema & its Effects

### **SPLANCHNIC CIRCULATION-HEPATIC,SPLENIC,INTESTINAL**

### **FOETO – PLACENTAL CIRCULATION**

### **CARDIOVASCULAR HOMEOSTASIS IN HEALTH**

- Cardiovascular adjustments during gravitational changes
- Cardiovascular adjustments during exercise

### **CARDIOVASCULAR HOMEOSTASIS IN DISEASES**

#### **CIRCULATORY SHOCK**

- i. Types & causes
- ii. Stages & clinical features of shock
- iii. Treatment of shock with physiological basis.
- iv. Circulatory Arrest
- v. Effect of circulatory arrest on the Brain.

### **BIO PHYSICS – BLOOD FLOW**

- Methods of Measuring Blood Flow
- Circulation Time
- Viscosity & Resistance
- Resistance & Capacitance Vessels
- Laplace Law
- Poiseuille – Hagen formula

# CENTRAL NERVOUS SYSTEM

## NEURON

- Structure
- Myelination
- Classification of Types of Nerve Fibres
- Excitation / Resting Membrane Potential / Action Potential
- Nerve Impulse Conduction
- Properties of Nerve Fibre
- Wallerian Degeneration
- Regeneration of Nerve Fibre After Injury

## SYNAPSE

- Physiological Anatomy
- Functions
- Electrical events
  - i. Excitatory post synaptic potential
  - ii. Inhibitory post synaptic potential
- Properties of synaptic transmission
- Factors affecting synaptic transmission

## NEURO TRANSMITTERS

- Biochemical classification
- Physiological classification

## **RECEPTORS ON THE SYNAPTIC NEURONAL MEMBRANE**

Sensory transduction

Pain

Types

Receptors

Dual pathways for Transmission of pain

Analgesic System

Referred pain

Visceral pain

Applied

- i. Hyperalgesia
- ii. Herpes Zoster
- iii. Headache

## **RECEPTOR ORGANS**

- Classification
- Electrical Events & Ionic Exchange and Receptors
- Properties

## **REFLEX ACTION**

- Reflex arc
- Classification
- Properties
- Examples
  - i. Mono synaptic reflex
  - ii. Poly synaptic reflex
  - iii. Golgitendon reflex



## **SPINAL CORD**

- Physiological anatomy & Nucleus
- Spinal cord Reflexes
- Regulation of Posture & Equilibrium
- Decerebrate animal
- Motion Sickness
- Meniere's disease

## **ASCENDING TRACTS OF THE SPINAL CORD**

## **DESCENDING TRACTS OF THE SPINAL CORD**

## **ORGANIZATION OF MOTOR SYSTEM**

- Motor Neuron Activities
- Upper Motor Neuron
- Lower motor Neuron
- Motor Unit
- Muscle Tone
- Corona Radiata
- Internal Capsule
- Effects of Lesions

## **EXTRAPYRAMIDAL SYSTEM**

- Parts of Extra Pyramidal System
- Extra Pyramidal Pathways
- Functions of Extra Pyramidal System
- Disorders of Extra Pyramidal Tract Lesions
- Sensory System

- i.Pain Pathway
- ii.Touch
- iii.Temperature
- iv.Vibration
- v.Proprioception

## **RECEPTORS**

- Ascending sensory fibres
- Centre
- Encoding:recognition of type of sensation

## **TRANSVERSE SECTION OF SPINAL CORD**

- Complete Transverse Section of Spinal Cord
- Spinal Shock
- Incomplete Transverse Section of Spinal Cord
- Autonomic Function Tests
- Hemi Section of Spinal cord
- (Brown- Sequard's Syndrome)

## **AUTONOMIC NERVOUS SYSTEM**

Divisions

Neurons of ANS

Sympathetic & Parasympathetic Nervous system

Autonomic neurotransmitters and receptors

Functions

Applied-Autonomic Failure

Decorticate Animal – Characteristics

## **CEREBRAL CORTEX**

- Structure
- Mapping of cortical areas
- Connections
- Functions
- Methods of Study of Cortical Functions

## **THALAMUS**

- Physiological Anatomy
- Nuclei
- Connections
- Functions
- Thalamic Syndrome
- Thalamic Animal – characteristics

## **CEREBELLUM**

Cerebellar lesion

- Physiological Anatomy
- Nuclei
- Connections
- Functions

## **BRAIN STEM**

- Pons
- Medulla Oblongata
- Midbrain
- Structure & Functions
- Medial, Lateral, Spinal Trigeminal lemnisci
- Effects of Section of Midbrain – Decerebrate Rigidity

## **HYPOTHALAMUS**

- Nuclei
- Connections
- Functions
- Disorders

## **RETICULAR FORMATION**

- Ascending Reticular Formation (ARAS)
- Connections of Reticular Formation
- Functions
- Electrical Activity of the Brain
- Evoked Cortical Potentials

## **ELECTROENCEPHALOGRAM**

-Normal EEG,Abnormal wavepattern

## **BASAL GANGLIA**

- Functional Anatomy
- Nuclei
- Connections
- Functions
- Disorders

## **LIMBIC SYSTEM**

- Functional Anatomy
- Nuclei
- Connections
- Functions

- Fear, Rage, Emotion, Motivation , Anger and Fear
- Role of neurotransmitters
- Applied Physiology

## **PHYSIOLOGY OF SLEEP**

- REM Sleep
- NREM Sleep
- Sleep Stages
- Sleep-Wake Cycle
- Consciousness
- Sleep Disorders
- Epilepsy
- Alzhiemer's disease

## **SPEECH**

- Definition
- Classification & Unconditioned Reflexes
- Conditioned Reflexes
- Learning
- Memory
- Short Term & Long Term Memories
- Disorders
  - i.Aphasia
  - ii.Word Blindness
  - iii.Agraphia
  - iv.Dyslexia
  - v.Stuttering

- Learning & Memory
- Reflex Learning
- Incidental learning
- Memory
- Implicit memory
- Explicit memory
- Episodic memory

### **MUSCLE TONE, POSTURE & EQUILIBRIUM**

- Divisions
- Functions
- Drugs Acting on ANS
- Disorders

### **CEREBROSPINAL FLUID**

- Formation
- Composition
- Functions
- Blood –Brain Barrier
- Blood CSF Barrier
- Clinical Application
- Pappilloedema
- Brain metabolism

## SPECIAL SENSES

### **EYE**

- Functional Anatomy
- Aqueous Humor – Formation, Circulation & Function
- Vitreous Humor – Formation, Function
- Eye Movements and Their Control
- Optics of the Eye

### **STRUCTURE OF RETINA**

- Rods & Cones
- Photochemistry of Vision
- Night Blindness
- Electrophysiological Tests

### **VISUAL PATHWAY**

- Effects of Lesions

### **REFRACTIVE ERRORS**

- Myopia
- Hypermetropia
- Strabismus
- Astigmatism
- Nystagmus
- Presbyopia

### **COLOUR VISION**

- Theories
- Colour Blindness
- Tests for Colour Vision

## **FIELD OF VISION**

## **PERIMETRY**

## **PUPILLARY LIGHT REFLEX**

## **ACCOMODATION REFLEX**

- Pathway
- Dark & Light Adaptation
- Disorders

## **PHYSIOLOGY OF HEARING**

## **PHYSIOLOGICAL ANATOMY**

- Tympanic Membrane & Ossicular System
- Cochlea
- Organ of Corti

## **CENTRAL AUDITORY MECHANISMS**

- Auditory pathway

## **HEARING ABNORMALITIES**

- Types of Deafness
- Tests for Hearing
- Audiogram
- Audiometric Tests

## **TASTE**

- Taste Bud and its Functions
- Mechanism of Stimulation of Taste Buds
- Primary Sensations of Taste
- Taste Pathway
- Encoding of taste information
- Abnormalities of Taste sensation.



## **SMELL**

- Olfactory membrane
- Olfactory Cells
- Stimulation of Olfactory Cells
- Adaptation
- Olfactory Pathway
- Applied-Abnormalities of Olfaction

## **MAINTENANCE OF LOG BOOK**

a. Every Post Graduate student shall maintain a record of skills He/She has acquired during the three years training period certified by the various Head of departments where He/She has undergone training including outside the institution.

b. The student should also participate in the teaching and training programs of Under Graduate students of medical, Dental and Other paramedical courses, both in Theory and Practicals from the first year onwards of the Post Graduate Degree course.

c. In addition the Head of the department should involve their post graduate students in Seminars, Journal clubs, group discussions and participation in workshops, CME program's national and international conferences organized by the Department, Institution and outside the institution in the state and outside the state.

d. Every Post Graduate student should be encouraged to present short title papers in conferences and improve on it and submit them for publication in indexed journals. Motivation by the Head of the Department is essential in this area to sharpen the skills of the Post Graduate Students.

e. The Head of the Department should scrutinize the log book every three months and certify the work done.

f. At the end of the course the student should summarise the contents and get the log book certified by the Head of the Department and submit the log book at the time of the University Practical Examination for the scrutiny of the board of examiners.

It is preferable that a post graduate student during the course to present one poster presentation and /or to read one paper at a national /state conference and /or to present one research paper which can be published/accepted for publication/sent for publication during the period of his/her postgraduate studies.

## **THESIS**

Every student registered as post graduate shall carry out work on an assigned research project under the guidance of a recognized post graduate teacher, the result of which shall be written up and submitted in the form of a thesis.

Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature. Thesis shall be submitted at least six months before the theoretical and clinical / practical examination.

The thesis shall be a bound volume of a minimum of 50 pages and not exceeding 75 pages of typed matter (Double line spacing and on one side only) excluding certification, acknowledgements, annexure and bibliography.

Thesis should consist of

- (a) Introduction
- (b) Review of literature
- (c) Aims and objectives
- (d) Material and methods
- (e) Result
- (f) Discussion
- (g) Summary and conclusion
- (h) Tables
- (i) Annexure
- (j) Bibliography

Four copies of thesis shall be submitted six months prior to the commencement of the theory examinations on the date prescribed by the Controller of Examinations of this University. The thesis should be approved by the Professor of that branch and the same has to be forwarded to the controller of examinations, by the head of the department through the Dean of the college.

Two copies in addition are to be submitted as an electronic version of the entire thesis in a standard C.D. format by mentioning the details and technicalities used in the C.D. format.

The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and clinical; and on the acceptance of the thesis by two examiners, the student shall be allowed to appear for the final examination.

**EVALUATION OF THESIS :**

**ACCEPTED / NOT ACCEPTED**

No marks will be given

## **PRACTICALS**

The procedures of experiments prescribed the student must familiarize themselves with the preparation of the reagents, handling of the apparatus and must be familiar with the common experiments for under graduate medical students.

### **I: HAEMATOLOGY**

#### **MAJOR EXPERIMENTS**

1. R.B.C. count
2. Total WBC count
3. Differential count
4. Absolute Eosinophil count
5. Absolute Leucocyte count
6. Reticulocyte count
7. Platelet count

#### **MINOR EXPERIMENTS**

1. Haemoglobin estimation
2. Erythrocyte Sedimentation Rate
3. Packed cell volume
4. Blood Group, Rh Typing
5. Bleeding Time/Clotting Time

### **II : CLINICAL PHYSIOLOGY**

1. General physical Examination
2. Recording of Blood pressure – Basal, Sitting, Standing, Recumbent positions & after mild exercise
3. Examination of Respiratory system
4. Examination of Cardio Vascular system

5. Examination of Cranial nerves I to XII
6. Examination of Motor & Sensory systems
7. Examination of Superficial & Deep Reflexes

### **CLINICAL SKILL**

1. Spirometry
2. Stethography
3. Peak flow meter
4. Respiratory efficiency tests
5. Perimetry
6. Cerebellar function tests

### **III : RECORDING OF ELECTROPHYSIOLOGICAL EVENTS**

1. ECG
2. Physiograph
3. Lung Function Tests
4. EMG
5. EEG

### **STUDY OF CHARTS, CALCULATIONS, AMPHIBIAN, MAMMALIAN AND ELECTROPHYSIOLOGY GRAPHS**

#### **TRAINING SCHEDULE**

Post graduate theory class

Post graduate practical class

Clinical postings

Conferences- National/ state

CME, clinical meetings, seminars - National/ state

Department- seminars, journal club, pedagogy

Para medical theory & practical classes

Internal Assessment – Theory - once in two months

Internal Assessment –Practical – once in three months

### **CLINICAL POSTINGS**

- ❖ Each clinical posting shall be of one week duration for acquiring hands on skills training
- ❖ Clinical postings will commence in the month of January and would be completed in March during the first Academic year of the course.
- ❖ Completion certificate with remarks should be obtained from the concerned clinical Head of the Departments.

#### **1. CARDIOLOGY**

- i. ECG Recording and Interpretation.
- ii. Observation of the Procedure for Echocardiogram and Interpretation.

#### **2. NEUROLOGY**

- i. Recording of Electro Encephalogram (EEG) and Interpretation.
- ii. Hands on Training in Nerve conduction studies.
- iii. Hands on Training in Electromyogram (EMG)

#### **3. PULMONOLOGY**

- i. Hands on Training in Computerized pulmonary function tests and Interpretation.

#### 4. **GASTROENTEROLOGY**

- i. Endoscope – Observation of the Procedure and evaluation of findings

#### 5. **OPHTHALMOLOGY**

- i. Hands on Training in Refraction.
- ii. Tonometry
- iii. Ophthalmoscopic examination of fundus & Interpretation
- iv. Perimetry

#### 6. **AUDIOLOGY**

- i. Pure-Tone Audiometry and Interpretation

#### 7. **BLOOD BANK**

- i. Blood collection Procedure and Storage of Blood
- ii. Separation of Blood Components
- iii. Cross Matching & Coomb's Test
- iv. Routine Procedure for Blood Transfusion
- v. Sub Typing of Blood Groups

8. **RADIOLOGY** : Ultra sonogram – Observation of the Procedure and its application in Clinical Practice

#### 9. **CENTER FOR MEDICAL SIMULATION :**

- i. Ultrasound and echo guided central venous pressure
- ii. Echo cardiography demonstrating different views of the cardiac chambers

- iii. Demonstration of carotid artery and internal jugular vein using ultrasound
- iv. Audio visual presentation on ECG, O<sub>2</sub> delivery systems, ABG analysis
- v. Hands on experience on simman on basic life support concepts.

## STRUCTURED TRAINING PROGRAMME

Simulation lab training programme, Biostatistic, Animal model, animal experimental solution preparation, Basic in computer and internet usage.

## SCHEME OF EXAMINATIONS

### THEORY

**PAPER I** – CELL PHYSIOLOGY, GENERAL PHYSIOLOGY, BLOOD, DIGESTIVE SYSTEM

**PAPER II** – EXCRETORY, ENDOCRINES & REPRODUCTION, MEDICAL GENETICS

**PAPER III** – CARDIOVASCULAR SYSTEM, RESPIRATORY SYSTEM ENVIRONMENTAL PHYSIOLOGY, EXERCISE AND SPORTS PHYSIOLOGY

**PAPER IV** – CENTRAL NERVOUS SYSTEM, SPECIAL SENSES, MUSCLE & NERVE PHYSIOLOGY, HISTORY OF MEDICINE, RECENT ADVANCES



## **EXAMINATION AND EVALUATION**

### **(1) EXAMINERS**

(a) All the Post Graduate Examiners shall be recognised Post Graduate Teachers holding recognised Post Graduate qualifications in the subject concerned.

(b) For all Post Graduate Examinations, the minimum number of Examiners shall be four, out of which at least two (50%) shall be External Examiners, who shall be invited from other recognised universities from outside the State and other two will be internal examiners for M.D.

(c) Under exceptional circumstances, examinations may be held with 3 (three) examiners provided two of them are external and Medical Council of India is intimated the justification of such action prior to publication of result for approval. Under no circumstances, result shall be published in such cases without the approval of Medical Council of India.

(d) In the event of there being more than one centre in one city, the external examiners at all the centres in that city shall be the same. Where there is more than one centre of examination, the University shall appoint a Supervisor to coordinate the examination on its behalf.

(e) The guidelines regarding appointment of examiners are as follows;-

1. No person shall be appointed as an examiner in any subject unless he fulfils the minimum requirements for recognition as a Post Graduate teacher as laid down by the Medical Council of India and has teaching experience of 8 (Eight) years as a Lecturer / Assistant Professor out of which he has not less than 5 (Five) years teaching experience after obtaining Post Graduate degree. For external examiners, he should have minimum three years experience of examinership for Post Graduate diploma in the concerned subject. Out of internal examiners, one examiner shall be a professor and Head of Department or Head of Department.
2. There shall be at least four examiners in each subject at an examination out of which at least 50% (Fifty percent) shall be external examiners. The external examiner who fulfils the condition laid down in clause – 1 above shall ordinarily be invited from another recognised university, from

outside the State: provided that in exceptional circumstances examinations may be held with 3 (three) examiners if two of them are external and Medical council of India is intimated with the justification of such examination and the result shall be published in such a case with the approval of Medical council of India.

3. An external examiner may be ordinarily been appointed for not more than three years consecutively. Thereafter he may be reappointed after an interval of two years.
4. The internal examiner in a subject shall not accept external examinership for a college from which external examiner is appointed in his subject.
5. The same set of examiners shall ordinarily be responsible for the written, practical or part of examination.
6. In the event of there being more than one centre in one city, the external examiners at all the centres in the city shall be the same.
7. There shall be a Chairman of the Board of paper – setters who shall be an external examiner and shall moderate the question papers.
8. Where there is more than one centre of examination, there shall be Co-ordinator appointed by the University who shall supervise and Co-ordinate the examination on behalf of the University with independent authority.
9. The Head of the Department of the institution concerned shall ordinarily be one of the internal examiners and second internal examiner shall rotate after every two year.

## **(2) Number of candidates**

The maximum number of candidates to be examined in Clinical / practical and Oral on any day shall not exceed eight for M.D. degree examination.

### **3) Number of examinations**

The university shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

### **(4) Doctor of Medicine (M.D.) Physiology**

M.D. examination shall consist of Thesis, Theory Papers, and clinical/Practical and Oral examinations.

#### **(a) Thesis**

Every candidate shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis.

Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the candidate to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature. Thesis shall be submitted at least six months before the theoretical and clinical / practical examination.

The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical; and on the acceptance of the thesis by two examiners, the candidate shall appear for the final examination.

#### **(b) Theory**

(i) There shall be four theory papers.

(ii) Out of these one shall be of Basic Medical Sciences and one shall be of recent advances.

(iii) The theory examinations shall be held sufficiently earlier than the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the start of the Clinical/Practical and Oral examination.

### **(c) Clinical / Practical and Oral**

(i) Clinical examination for the subjects in Clinical Sciences shall be conducted to test the knowledge and competence of the candidates for undertaking independent work as a specialist/Teacher, for which candidates shall examine a minimum one long case and two short cases.

(ii) Practical examination for the subjects in Basic Medical Sciences shall be conducted to test the knowledge and competence of the candidates for making valid and relevant observations based on the experimental/Laboratory studies and his ability to perform such studies as are relevant to his subject.

(iii) The Oral examination shall be thorough and shall aim at assessing the candidate knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which form a part of the examination.

A candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory, (2) Practical including clinical and viva voce examination.

### **Evaluation of Answer Scripts**

The answer books will be valued by two examiners. One of the two examiners will be from this university and the other will be from any other university. The Average of the two marks secured by the candidate will be taken into account. If the difference between two marks exceeds 10%, the answer scripts shall be valued by the third examiner. The average of the nearest two marks shall be considered as the final mark.

**MODEL QUESTION PAPER  
MD PHYSIOLOGY  
PAPER I**

CELL PHYSIOLOGY, GENERAL PHYSIOLOGY, BLOOD, DIGESTIVE SYSTEM

**TOTAL MARKS :100**

**TIME :3 HOURS**

Answer each section in separate answer books.

Draw neat-labeled diagrams to illustrate your answer

**SECTION A**

**I : ESSAY QUESTIONS**

**2 X 20 = 40 MARKS**

1. Explain the pathways of coagulation with neat diagram. Add notes on Anticoagulants, and their mechanism of action.
  
2. Describe the composition, functions and regulation of pancreatic juice. Briefly describe the pancreatic functions test.

**SECTION B**

**II: SHORT ANSWERS**

**10X6 = 60 MARKS**

1. Cellular Junction
2. Apoptosis
3. Sodium potassium pump
4. Secondary active transport
5. Rh incompatibility
6. Immunoglobulins
7. Functions of Plasma proteins
8. Gastrin
9. Functions of Bile
10. Movements of Small Intestine

**MODEL QUESTION PAPER  
MD PHYSIOLOGY  
PAPER II**

EXCRETORY, ENDOCRINES & REPRODUCTION, MEDICAL GENETICS

**TOTAL MARKS :100**

**TIME :3 HOURS**

Answer each section in separate answer books.

Draw neat-labeled diagrams to illustrate your answer

**SECTION A**

**I : ESSAY QUESTIONS**

**2 X 20 = 40 MARKS**

1. Described the synthesis, release, actions and regulations of thyroid hormones.
2. Define Glomerular Filtration Rate. Describe the factors affecting Glomerular Filtration Rate. Add a note on renal clearance tests.

**SECTION B**

**II: SHORT ANSWERS**

**10X6 = 60 MARKS**

1. Transcription
2. Juxta Glomerular Apparatus
3. Lesions of Urinary Bladder
4. Cushing's syndrome
5. Spermatogenesis
6. Functions of cortisol
7. Acromegaly
8. Placental hormones
9. Menstrual cycle
10. Ovulation tests

**MODEL QUESTION PAPER  
MD PHYSIOLOGY  
PAPER III**

CARDIOVASCULAR SYSTEM, RESPIRATORY SYSTEM ENVIRONMENTAL  
PHYSIOLOGY, EXERCISE AND SPORTS PHYSIOLOGY

**TOTAL MARKS: 100**

**TIME :3 HOURS**

Answer each section in separate answer books.

Draw neat-labeled diagrams to illustrate your answer

**SECTION A**

**I : ESSAY QUESTIONS**

**2X20= 40 MARKS**

1. Define Cardiac output and cardiac index. Describe the factors affecting cardiac output. List the methods of estimation.
2. Describe the neural and chemical regulation of respiration.

**SECTION B**

**II: SHORT ANSWERS**

**10X6 = 60 MARKS**

1. Pulmonary Surfactant
2. Physiological changes during exercise on Cardio Vascular System
3. Heart sounds
4. Vasomotor center
5. Sino aortic reflex
6. Alveolar capillary membrane
7. Artificial respiration
8. Transport of Carbon Dioxide
9. Oxygen – haemoglobin dissociation curve
10. Haemodynamics of blood

**MODEL QUESTION PAPER  
MD PHYSIOLOGY  
PAPER IV**

CENTRAL NERVOUS SYSTEM, SPECIAL SENSES, MUSCLE & NERVE  
PHYSIOLOGY, HISTORY OF MEDICINE, RECENT ADVANCES

**TOTAL MARKS: 100**

**TIME: 3 HOURS**

Answer each section in separate answer books.

Draw neat-labeled diagrams to illustrate your answer

**SECTION A**

**I : ESSAY QUESTIONS**

**2 X 20 = 40 MARKS**

1. Define Synapse. Describe the transmission of impulse across synapse.  
Add a note on IPSP.
2. Describe the visual pathway with diagram. Add a note on lesions of visual pathway.

**SECTION B**

**II: SHORT ANSWERS**

**10X6 = 60 MARKS**

1. Light reflex
2. Parkinson's disease
3. Cerebellar function test
4. DNA probing technique
5. Tests for hearing
6. Thalamic Syndrome
7. Myasthenia gravis
8. Neuromuscular junction
9. Saltatory conduction
10. Functions of hypothalamus



<b>UNIVERSITY PRACTICALS DISTRIBUTION OF MARKS</b>		
<b>I : HAEMATOLOGY</b>		
<b>MAJOR</b>	<b>40 MARKS</b>	<b>70 MARKS</b>
<b>MINOR</b>	<b>20 MARKS</b>	
<b>CHART</b>	<b>10 MARKS</b>	
<b>II : CLINICAL PHYSIOLOGY</b>		
<b>MAJOR</b>	<b>40 MARKS</b>	<b>70 MARKS</b>
<b>SKILL</b>	<b>20 MARKS</b>	
<b>CHART</b>	<b>10 MARKS</b>	
<b>III : ELECTROPHYSIOLOGY</b>		
<b>RECORDING OF ELECTROPHYSIOLOGY</b>	<b>30 MARKS</b>	<b>60 MARKS</b>
<b>CHART</b>	<b>30 MARKS</b>	
<b>TOTAL</b>		<b>200 MARKS</b>
<b>VIVA</b>		<b>50 MARKS</b>
<b>PEDAGOGY</b>		<b>50 MARKS</b>
<b>TOTAL</b>		<b>300MARKS</b>

## MARKS QUALIFYING FOR A PASS

MARKS QUALIFYING FOR A PASS	MAXIMUM MARKS	QUALIFYING FOR A PASS 50% MARKS
Theory Examination	400	200
Practical Including clinical and Viva voce examination	300	150

A student shall secure not less than 50% marks in each head of passing, which shall include 1.Theory 2.Practical including clinical and viva voce examination.

## RECOMMENDED BOOKS & JOURNALS

### TEXT BOOK

1. Medical Physiology - Arthur C. Guyton, John E. Hall 11<sup>th</sup> Edition, Latest Edition, Saunders, 2006.
2. Review of Medical Physiology - William F.Ganong 23<sup>rd</sup> Edition, Mosby, 2010

### PRACTICAL MANUAL

1. Practical Physiology - G.K.Pal 2<sup>nd</sup> Edition, Orient Longman, 2005.
2. Hutchison's Clinical Methods - Swash Michael 22<sup>nd</sup> Edition, Saunders, 2007.

## REFERENCE BOOKS

### TEXT BOOK

1. Lectures on the History of Physiology - M Foster 1<sup>st</sup> Edition, General books, 2009.
2. Physiology Basis of Medical practice - Best & Taylor 12<sup>th</sup> Edition, 1990.
3. Samson & Wright applied Physiology - Cyril a.Keele, Eric Neil, Norman Joels 13<sup>th</sup> Edition, Oxford, 2006.
4. Medical Physiology - Veernow.B.Mountcastle 14<sup>th</sup> Edition, Mosby, 1979.
5. Human Physiology from Cells to System - Sherwood 6<sup>th</sup> Edition, Thomson, 2007.
6. Cellular Physiology of Nerve and Muscle – Mathew 1<sup>st</sup> Edition, Blackwell Sciences, 1995.
7. General and Comparative Physiology - WS Hoar 2<sup>nd</sup> Edition, McGraw Hill, 1913.
8. Physiology – NMS - John Bullock M.S., Joseph Boyle, Mecheal B.Wang 4<sup>th</sup> Edition, Lippincott, 2001.
9. Textbook of Hematology – Williams 7<sup>th</sup> Edition, Mc Graw Hill, 2006.
10. Clinical Hematology (2 volumes) - Wintrob's 11<sup>th</sup> Edition Lippincott Williams & Willkins, 1999.
11. Gastrointestinal Physiology - Leonard R. Johnson 7<sup>th</sup> Edition, Elsevier, 2007.
12. Renal Physiology - Koeppen Stanton 4<sup>th</sup> Edition, Elsevier, 2007.
13. Respiratory Physiology The Essential – West 8<sup>th</sup> Edition Lippincott Williams & Willkins, 2008.
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***The path to success is to take a massive, determined action.***

**- Antony Robbins**