

(Annexure- I)  
**DEPARTMENT OF PHYSIOLOGY**  
**J.N. MEDICAL COLLEGE, ALIGARH MUSLIM UNIVERSITY,**  
**ALIGARH**

**CURRICULUM OF PHYSIOLOGY FOR GRADUATE MEDICAL STUDENTS**

**PAPER I**

**UNIT –I**      **AUTONOMIC NERVOUS SYSTEM**

- General Organization of the ANS.
- Physiological Anatomy of the sympathetic N.S.
- Physiological Anatomy of the Parasympathetic N.S.
- Distinguishing features of the Sympathetic and Parasympathetic Nervous System.
- Effects of ANS on various organs of the body.

**CENTRAL NERVOUS SYSTEM**

- Receptors:- Classification and properties
- Reflexes: - Reflex Arc, Reflex action, Monosynaptic and Polysynaptic, Stretch and withdrawal reflex, Properties of reflex.
- Pathways of different sensations (Touch, Proprioception, Temperature).
- Pain pathways, Visceral pain, Hyperalgesia, Referred pain, Central analgesia system.
- Synapse, Properties, Types and transmission.
- Neuromuscular junction.
- Reticulating activation system, Thalamus.
- Cerebral cortex, Layers of cortex, function of specific cortical areas, Intellectual function of the brain, Learning and memory.
- Spinal cord, its motor functions, Cord reflexes, Muscle receptors, Spinal cord transection and spinal shock.
- Cortical and brain stem control of motor function, Motor cortex and corticospinal tract, Role of brain stem in controlling motor function, Vestibular sensations and the maintenance of equilibrium.
- Cerebellum, Basal ganglia & overall motor control.
- Behaviour and Motivation mechanism of brain, Limbic and Hypothalamus.
- Sleep, Speech, & Dementia.
- Body temperature regulation.
- C.S.F.
- E.E.G. & Epilepsy.

**UNIT- II**      **SPECIAL SENSES**

- Physiology of Taste.
- Physiology of Hearing.
- Physiology of Olfaction.
- Physiology of Vision.

### **UNIT- III      GASTROINTESTINAL TRACT, LIVER, DIET, VITAMINS AND BMR**

- General consideration and electrical activity of GIT, Nerve and blood supply.
- Motility of Gut.
- Function and regulation of salivary, Gastric, Pancreatic, Bile and Intestinal secretions.
- Liver & Biliary system, Jaundice & Liver function tests.
- Digestion & absorption of carbohydrates, Protein, Lipids, Water and electrolytes.
- GIT hormones.
- Applied aspect disorders of GIT.
- Diet and BMR
- Vitamins.

### **UNIT- IV      BLOOD, IMMUNITY, AND LYMPHATIC SYSTEM**

- Introduction to Blood.
- Plasma proteins.
- Red blood cells, Anaemia and Polycythemia.
- Haemoglobin- Structure, types and functions, Iron metabolism.
- Blood group and transfusion.
- White blood cells- formation, structure, functions and disorders.
- Immunity- definition, classification and applied aspects.
- Development and function of Platelets.
- Coagulation of blood and its disorders.
- Reticuloendethelial system.

### **UNIT- V      MUSCLE, NERVE PHYSIOLOGY AND BIOPHYSICS**

#### **Muscle Physiology-**

- Skeletal muscle- Macro and Micro anatomy, Tubular system, Electrical characteristics, Molecular basis of contraction.
- Simple twitch- Types of contraction, Summation of contractions.
- Energy source and metabolism of muscles contractions, Fiber types of skeletal muscle, Protein isoforms in muscle.
- Properties of muscle, Motor unit, Grading of muscular activity, Effect of denervation Electromyography, Muscular dystrophy.
- Smooth muscle types, Electrical and mechanical property of visceral smooth muscle, Molecular basis of contraction of smooth muscle.
- Cardiac muscle- structure, Electrical property and mechanical contractions.

#### **Nerve Physiology-**

- Property of nerve
- Classification of nerve fibers (Effect of nerve injury, Nerve growth factor).

#### **Bio-Physics-**

- Physical principles of transport across cell membranes and capillary wall.
- Bio-potentials (Resting potentials, Electrotonic potential, Action potential).
- Physical principles governing flow of blood in heart and blood vessels and flow of air in air passages.

## **PAPER II**

### **UNIT- I      ENDOCRINE SYSTEM**

1. General concepts in Endocrinology-
  - Regulatory mechanism in endocrine glands.
  - Communication in Human body-
    - Endocrine communications.
    - Mechanism of hormonal action.
  - Principles, methods of hormonal assay.
2. Hypothalamus its nuclei and their secretions.
3. Anterior pituitary gland and its hormones.
  - Growth hormone: - Function regulation, factors affecting its secretion and effects of hyper and hypo secretion of growth hormone.
  - Prolactin and its functions.
4. Posterior pituitary gland its hormones their functions and hyposecretory state of ADH.
5. Thyroid gland, its hormones, synthesis, secretion, regulation and functions. Effect of its hypo and hypersecretions of body.
6. Parathormone calcitonin and vitamins D, their effects on bone, GIT and kidney, Calcium metabolism and its regulation, Effects of hypocalcemia and hypersecretion of parathyroid on the body.
7. Endocrine pancreas
  - Its hormones, Secretion of insulin, its effects on the metabolism, diabetes mellitus.
  - Glucagon, Its effects on metabolism and regulation of secretions.
  - Somatostatin & Pancreatic Polypeptide and their functions.
8. Adrenal gland its parts and hormones.
  - Mineralo-corticoid synthesis functions its regulation of secretion and effect of hyper and hypo secretory states.
  - Glucocorticoids its synthesis, functions and hyper and hypo secretory states.
  - Adrenal-androgens and their synthesis and hypersecretory states.
  - Biosynthesis of adrenal medullary hormones.

### **UNIT-II      REPRODUCTION, NEONATAL PHYSIOLOGY AND FAMILY PLANNING METHODS**

- Introduction to reproduction and spermatogenesis.
- Male sexual act abnormality relating to male infertility.
- Male hormonal system, synthesis, mechanism of action, degradation and physiological function.
- Female reproductive system, female hormonal system, ovarian cycle/endometrial cycle.
- Female sex hormones (oestrogen & progesterone), Synthesis, Action, Degradation and functions.
- Regulation of female monthly rhythm.
- Pregnancy, fertilization of ovum, development of placenta and its function and pregnancy tests.
- Parturition and lactation, family planning methods.
- Fetal physiology, Adjustments of infant to breathing & circulation.
- Growth and development of child (Development of milk stones).

### **UNIT-III                      RESPIRATION**

- Mechanism of pulmonary ventilation, surfactant, compliance.
- Pulmonary volumes and capacities.
- Diffusion of gases through the respiratory membrane.
- Effect of ventilation perfusion ratio on alveolar gas concentration.
- Transport of oxygen in blood.
- Transport of carbon dioxide in blood.
- Regulation of respiration.
- Hypoxia.
- Hypercapnia, Cyanosis, Dyspnea.
- Artificial respiration.
- High altitude Physiology.
- Physiology of deep sea diving.
- Sports Physiology.

### **UNIT- IV                      CARDIOVASCULAR SYSTEM**

- Introduction.
- Rhythmic excitation of heart.
- Cardiac cycle.
- Heart sounds: - Dynamics of valvular and congenital heart defects.
- Recording and study of normal Electrocardiogram.
- Cardiac output and venous return and their regulation, Methods of measurement of cardiac output.
- Heart rate and its regulation.
- Arterial blood pressure, Determinates and regulation.
- Physiological basis of hypertension.
- Muscle blood flow.
- Coronary circulation.
- Circulatory shock and physiological basis of its treatment.
- Effect of exercise on circulation.

### **UNIT- V                      EXCRETORY SYSTEM, WATER BALANCE, ACID BASE BALANCE, SKIN**

- Body fluid compartments.
- Physiological anatomy and functions of kidney.
- GFR
- Formation of urine:
  - > Processing of the filtrate in the tubules.
  - > Counter current mechanism.
  - > Formation of dilute and concentrated urine.
- Micturition
- Renal function tests.
- Regulation of water and electrolyte balance.
- Regulation of Acid Base balance.
- Skin and its appendages.

**PHYSIOLOGY PRACTICAL FOR MBBS STUDENTS**

**List of Experiments**

**Human Lab**

1. Examination of Arterial Pulse.
2. Measurement of Blood Pressure.
3. To study effect of postures and exercises on Blood Pressure.
4. Normal Electrocardiogram and calculation of mean electrical axis; duration, amplitude of waves and intervals.
5. Stethography.
6. Spirometry.
7. Acuity of Vision and Colour Vision.
8. Perimetry.
9. Demonstration of EEG, EMG, Nerve Conduction Velocity, Visual, Somatosensory & Auditory Evoked Potentials.

## **List of Experiments**

### **Clinical Lab**

1. Examination of Cardiovascular System
2. Examination of Respiratory System
3. Examination of Abdomen
4. Examination of Nervous System
5. Nutrition & Dietetics Principles for Preparation of Diet
6. Physical Fitness & Exercise Tolerance Tests
7. Glucose Tolerance Tests (recorded graph)
8. Demonstration of BLS (Basic Life Support)

## **Haematology Lab**

### **List of Experiments**

1. Light Microscope.
2. Collection of blood samples.
3. Preparation of blood films.
4. Identification of various blood cells
5. To determine differential Leukocytes Count.
6. Estimation of Haemoglobin Concentration.
7. To determine Blood Groups.
8. To determine Bleeding and Clotting time.
9. To study Haemocytometry (Diluting pipettes and Neubauer's chamber).
10. To determine total RBC Count.
11. To determine total WBC Count.
12. To determine the Platelet Count (By Direct method and by Relative method).

## **Experimental Physiology (Amphibian / Mammalian)**

### **List of Experiments**

1. Aims and Objective of Experimental Physiology –
  - (i) Classification- To study & demonstrate different muscles & their properties.
2. To study the apparatus and nomenclature (Including Physiograph).
3. To study Skeletal Muscle.
  - A. Nerve Muscle Preparation.
  - B. To Demonstrate Simple Muscle Curve and Calculate the different phases.
  - C. To Demonstrate of effect of temperature on Muscle nerve preparation.
  - D. To Demonstrate Summations-
    - (i) Effect of change of strength of stimuli (Spatial Summation).
    - (ii) Effect of change of frequency (Temporal Summation).
      - (a) Effect of two subminimal stimuli in different phases.
      - (b) To Demonstrate Beneficial effect.
      - (c) To Demonstrate Incomplete & Complete tetanus.
4. To Demonstrate Fatigue.
5. To study effect of load & length on muscle contraction (free loaded & after loaded).
6. To study of properties of Cardiac Muscles-
  - (i) To record normal Cardiogram of Frog's heart.
  - (ii) To record the effect of temperature on Frog's heart.
  - (iii) To Demonstrate Extrasystole & Compensatory Pause.
  - (iv) To Demonstrate Stannius preparation of Frog's heart.
  - (v) To record Simple Cardiac Muscle Twitch after stimulation and to demonstrate refractory period.
  - (vi) To Demonstrate All or None law & Staircase phenomenon.
  - (vii) To Demonstrate exposure of Vagus Nerve Crescent and Vagal escape.
  - (viii) To study effect of drugs on Frog's heart.
7. To study Smooth muscle in Rabbit.
  - (i) Demonstrate of apparatus and dissection of intestine of rabbits.
  - (ii) To study movements of Isolated Gut.
  - (iii) To study effect of drugs on Rabbit Gut.