

**DEPARTMENT OF PHYSIOLOGY
J.N. MEDICAL COLLEGE, AMU, ALIGARH**



M.D.PHYSIOLOGY

Physiology: Theory & Practical

- I. a. General & Cellular Physiology
- b. Haematology
- c. Renal Physiology & Fluid Balance
- II. a. Cardio-vascular Physiology
- b. Respiration
- c. Environmental Physiology

- III. a. Nerve & Muscle Physiology
- b. General, Sensory & Motor Physiology
- c. Special Senses
- d. Limbic System and Higher Nervous System
- IV. a. Nutrition & Metabolism
- b. Gastro- Intestinal System
- c. Endocrine & Reproduction

Themes and Topics

a. General & Cellular Physiology

- Cell as the living unit of the body
- The internal environment
- Body fluid compartments
- Homeostasis
- Control systems
- Organization of a cell
- Physical structure of a cell membrane
- Transport across cell membranes

- Functional systems in the cells
- Genetic code , its expression, and regulation of gene expression
- Cell cycle and its regulation
- Physiology of growth & ageing

b. Haematology

- Erythrocytes
 - erythropoiesis
 - structure & function of RBCs
 - formation of haemoglobin
 - destruction & fate of RBCs
 - anaemias
 - polycythemias
- Leucocytes
 - general characteristics
 - genesis & life span of WBCs
 - classification & functions of each type of WBC
 - leukopenia
 - leukemias
- Blood groups
 - classification
 - antigenicity
 - agglutination
 - blood typing
 - principles of transfusion
 - Hazards of transfusion
- Hemostasis
 - components of hemostasis
 - mechanisms of coagulation
 - coagulation tests
 - anticoagulants
 - Fibrinolytic system (plasmin system)
- Immunity
 - Innate immunity
 - Acquired immunity
 - Allergy, hypersensitivity and immunodeficiency

- autoimmune disorders

c. Renal Physiology & Fluid Balance

- Water balance; regulation of fluid balance
- Urine formation
- Regulation of extra cellular sodium & osmolarity
- Renal mechanisms for the control of blood volume, blood pressure & ionic composition of ECF
- Regulation of acid –base balance
- Micturition
- Diuretics
- Renal failure

a. Cardio-vascular Physiology

- Properties of cardiac muscle
- Cardiac cycle
- Heart as a pump
- Cardiac output
- Nutrition & metabolism of heart
- Specialized tissues of the heart
- Generation & conduction of cardiac impulse
- Control excitation & conduction
- Electrocardiogram
- Arrhythmias
- Principles of Haemodynamics
- Neurohormonal regulation of cardiovascular function
- Microcirculation & lymphatic system
- Regional circulations
- Cardiac failure
- Circulatory shock

b. Respiration

- Functional anatomy of respiratory system
- Pulmonary ventilation
- Alveolar ventilation
- Mechanics of respiration
- Pulmonary circulation

- Pleural fluid
- Lung edema
- Principle of gas exchange
- Oxygen & carbon-dioxide transport
- Regulation of respiration
- Hypoxia
- Oxygen therapy and toxicity
- Artificial respiration
- Environmental Physiology

c. Physiology of hot environment

- Physiology of cold environment
- High altitude
- Aviation Physiology
- Space Physiology
- Deep sea diving & hyperbaric conditions

a. Nerve & Muscle Physiology

- Resting membrane potential
- Action potential
- Classification of nerve fibers
- Nerve conduction
- Degeneration & regeneration in nerves
- Functional anatomy of skeletal muscle
- Neuro-muscular transmission and blockers
- Excitation-contraction coupling
- Mechanism of muscle contraction
- Smooth muscle

b. General Sensory & Motor Physiology

- General design of nervous system
- Interneuronal communication
- Classification of somatic senses
- Sensory receptors
- Sensory transduction
- Information processing
- Dorsal column & medial lemniscal system

- Thalamus
- Somatosensory cortex
- Somatosensory association areas
- Pain, touch vibrations & thermal sensations.
- Organization of spinal cord for motor function
- Reflexes and reflex arc
- Brain stem and cortical control of motor function
- Cerebellum
- Basal ganglia
- Maintenance of posture and equilibrium & muscle tone.
- Motor cortex

c. Special Senses

- Optics of vision
- Receptors and neural function of retina
- Colour vision
- Perimetry
- Visual pathways
- Cortical vision function
- Functions of external and middle ear
- Cochlea
- Semicircular canals
- Auditory pathways
- Cortical auditory function
- Deafness & hearing aids
- Primary taste sensations
- Taste buds
- Transduction & transmission of taste signals
- Perception of taste
- Peripheral olfactory mechanisms
- Olfactory pathways
- Olfactory perception

d. Limbic System and Higher Nervous System

- Autonomic nervous system
- Limbic system and hypothalamus

- EEG
- Sleep
- Emotion & Behaviour
- Learning & memory

a. Nutrition & Metabolism

- Carbohydrates
- Fats
- Proteins
- Minerals
- Vitamins
- Dietary Fiber
- Recommended Dietary Allowances
- Balanced Diet
- Diet for infants, children, pregnant & lactating mothers, and the elderly
- Energy metabolism
- Obesity & Starvation

b. Gastro-intestinal System

- General principles for GI function
- Mastication & swallowing
- Esophageal motility
- Salivary secretion
- Gastric mucosal barrier
- Pancreatic & biliary secretion
- Gastrointestinal motility
- Digestion & absorption
- Functions of colon
- Pathophysiology of peptic ulcer and diarrheal disease
- G-1 hormones
- Liver functions & LFT

c. Endocrines & Reproduction

- Classifications of hormones
- Mechanism of Hormone action
- Measurement of hormones in blood
- Endocrine functions of the hypothalamus

- Pituitary
- Thyroid
- Adrenals
- The endocrine pancreas
- Pathophysiology of diabetes
- Parathyroid, calcitonin, Vit D & calcium metabolism
- Pineal gland
- Testosterone & male sex hormones
- Spermatogenesis
- Hyper & Hypogonadism
- Menstrual cycle, ovarian cycle
- Female sex hormones
- Pregnancy & Lactation
- Functions of Placenta
- Parturition
- Lactation

Apart from the above topics in general and systemic physiology, the students are introduced to:

1. Biophysics
2. Biochemistry
3. Biostatistics
4. Molecular Biology
5. Medical Education
6. History of Medicine
7. Recent advances in Physiology
8. Recent Physiological techniques.

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LIST OF THE EXPERIMENTS FOR M.D. (PHYSIOLOGY)

HUMAN EXPERIMENTS: -

1. Determination the physical fitness of a subject.
2. To determine the effect of exercise on blood pressure & heart rate.
3. Recording and analyzing 12 lead E.C.G and measurement of mean electrical axis.
4. Clinical examination of the nervous system, cardiovascular system and respiratory system.
5. Recording of the chest movements by stethograph.
6. Determination of various lung volumes and capacities.
7. To record the field of vision by Perimeter.

ANIMAL EXPERIMENTS: -

1. To study the movements of isolated segment of small intestine of rabbit and to demonstrate the effect of –
 - i) Adrenaline
 - ii) Acetylcholine
2. To study the effect of Adrenaline, Acetylcholine, Atropine and Histamine on isolated perfused rabbit's heart.
3. To study of the effect of ions in an isolated perfused rabbit's heart.

CLINICAL PHYSIOLOGY EXPERIMENTS: -

ESTIMATION BY COLORIMETER/SPECTROPHOTOMETER

1. Blood glucose or serum glucose.
2. Blood or serum lipid profile.
3. Serum creatinine.
4. Total serum lipid.
5. Total protein in plasma or serum.
6. Serum bilirubin.
7. Serum Urea estimation
8. Semen analysis
9. Pregnancy test

ESTIMATION BY MEDIFLAME/PHOTOMETER.

Estimation of Sodium and Potassium in serum.

HAEMATOLOGY EXPERIMENTS: -

1. An introduction to experiments on blood.
2. To prepare and examine the peripheral blood smear.
3. To determine the differential leucocytes count.
4. To determine the arneth count.
5. To determine the total leucocytes count.
6. To determine the absolute eosinophil count.
7. To determine the total red blood cell count.
8. To determine the platelet count.
9. To determine the osmotic fragility of erythrocytes.
10. To determine the haemoglobin concentration of blood.
11. To determine the reticulocyte count.
12. To determine the ABO and Rh blood groups.
13. To determine the bleeding time and coagulation time.
14. To determine the erythrocyte sedimentation rate.
15. To determine the packed cell volume.
16. To prepare the heamin crystals.
17. To calculate various absolute values of blood.