GOAL
The goal of postgraduate Medical education in Physiology shall be to produce competent medical teachers who shall –
1. Perform the professional obligations ethically and in keeping with the objectives of National Health Policy.
2. Have acquired the basic skills in teaching medical and para medical students.
3. Be aware of the contemporary advances and developments in Physiology.
4. Have acquired a spirit of scientific enquiry and are oriented to the principles of research methodology.

OBJECTIVES
The candidate, upon successfully qualifying in MD Physiology examination, should be-
1. A competent Physiologist
2. Able to effectively teach medical and paramedical students the basic physiological mechanisms of human body with reference to their implications in the pathogenesis of diseases (patho physiology) and the physiological basis of their management.
3. Able to conduct such clinical/experimental research as would have significant bearing on human health and patient care and also able to publish research papers.
4. Acquire skills in conducting collaborative research in the field of Physiology and allied sciences.
5. Able to demonstrate to the students that the knowledge of physiology can be used in a variety of clinical settings to solve diagnostic and therapeutic problems.
6. Encourage students to participate in workshops/seminars/journal clubs/demonstrations in allied departments to acquire skills for collaborative research.

SYLLABUS - THEORY

I. General Physiology

General and Cellular Basis of Human Physiology
Organisation of body fluids.

Functional morphology of cell
Transport across cell membrane & capillary wall
Intercellular communications
Genetics and Gene therapy
Homeostasis, Bio electric potentials

2. Haematology

Composition & functions of blood, functions of plasma proteins.
The functional basis of different formed elements of blood. Elaborate on
the current concepts of hemopoiesis, abnormalities in the RBC function with the func-
tional basis of anaemias, the abnormalities in WBC, the basis of the various types of
immunological responses in the human body and the mechanisms of regulation of
immune responses, abnormalities in platelet functions, haemostatic mechanisms in
health and disease.
Current trends in the classification of various blood groups & physiological considera-
tions in blood transfusion
Blood volume.
Lymph & tissue fluid.

3. Nerve Muscle Physiology

Major historical landmarks in the development of current concepts of nerve muscle
physiology.
Nerve Cells- Structure, properties and function, Classification of fibre types
Bioelectric potentials, CRO
Nerve degeneration & regeneration
Mixed Nerve – properties
Synapse – properties and functions
Neuroglia
Skeletal muscle- Physiological anatomy of skeletal muscle, Molecular mechanism of
muscle contraction, types of contraction, length tension relationship.
Electrical Phenomena & ionic fluxes, energy sources and metabolism
Properties of muscle in intact organism
Motor unit, effects of denervation, EMG and its applications.
Cardiac muscle – Functional anatomy, electrical properties, mechanical properties,
length tension relationship. Conducting system of heart and its electrical properties
Smooth muscle – Morphology, Types, electrical & mechanical properties, control of smooth muscle contraction, length - tension relationship, plasticity.

Neuromuscular Physiology, diseases affecting neuromuscular junction.

4. Nervous System

Importance of evolution and development

The contributions of neurophysiologists who have led to the development of the present status of neurophysiology

Various methods used for the study of neurophysiology

Organisation of the nervous system

Sensory System

- Receptors, Pathways, thalamus, cortical Sensory areas.
  - Important abnormalities of pain & other somatic sensation.

Motor System

- Motor functions of spinal cord and spinal cord reflexes
- Cortical and brainstem control of motor function
- Cerebellum. Basal ganglia and overall motor control
- Cerebral cortex, Motor & Sensory dysfunction at different levels.
- Vestibular apparatus and equilibrium, posture & movement
- Neurotransmitters

Autonomic Nervous System

Hypothalamus, Limbic System

Speech, Memory, Learning, Behaviour, Conditioned reflexes.

Sleep and electrical activities of brain

Cerebrospinal fluid

5. Special Senses

Olfaction, Gustation, Vision, Audition.

6. Cardiovascular System

Organisation of CVS, Origin and spread of cardiac impulse

Cardiac Cycle – Normal electrical and mechanical events & their abnormalities.

Cardiac output, Haemodynamics

Blood pressure & its regulation.

Regional circulation including lymphatic circulation, foetal circulation.

Shock, cardiopulmonary adjustments in health and disease.
Basic principles in the assessment of CVS function.

7. **Respiratory System**

Functional Anatomy of Respiratory System

Respiratory movements & muscles involved in it. Bronchial tone.

Mechanics of Pulmonary Ventilation - Spirometry - Lung volumes & capacities.

Pressures during the breathing cycle, elastic properties of lung, compliance of lung &
chest wall, alveolar surface tension, work of breathing, airway resistance.

Ventilation & Perfusion, Pulmonary Ventilation, Alveolar ventilation, Dead space,
Pulmonary blood flow, Ventilation Perfusion Ratio.

Composition of respiratory gases.

Respiratory Membrane, Physics of Diffusion.

Transport of Gases - Transport of Oxygen, Oxygen Dissociation curve and factors af-
fecting it. Carbondioxide transport, CO₂ dissociation curve

Myoglobin & foetal haemoglobin

Regulation of respiration

Respiratory adjustments in health & disease – Including high altitude Physiology &
Acclimatisation

O₂ therapy, Use of Ventilators, artificial respiration.

8. **Environmental Physiology**

Thermo regulatory mechanism in the body and their behaviors in acute & chronic
thermal stress.

Effects of exposure to hypo & hyperbaric environment

Acclimatization process

Effects of ‘G’ forces

Mechanism related to biological rhythm & their role in normal state of body function.

Effect of different types of environmental pollutants on the body.

9. **Gastro Intestinal System**

Nutrition & metabolism, energy balance

Functional anatomy of GIT

Secretions of GIT and associated glands and their regulation

Movements of GIT

Digestion and Absorption
Describe the basis of evaluation of metabolic functions in health and disease with special reference to liver function tests.

Gastrointestinal hormones, disorders of gastrointestinal function.

10. Endocrinology

Synthesis & secretion, transport, metabolism, mode of action and estimation of various hormones secreted by the endocrine glands.

The neurohumoral mechanisms involved in regulation of hormonal secretions and their mechanism of action at cellular level.

Changes that occur in body as a result of hypo and hyper function of different glands and their hormonal interactions correlating with the function tests.

Bone physiology and calcium metabolism

Endocrine functions of other organs.

Growth, development and ageing.

11. Reproductive System

Development and functions of gonads

Sex differentiation and their abnormalities

Male reproductive system

Female reproductive system

Puberty, Menopause

Pregnancy, Lactation, Contraception

Infertility & its management

12. Excretory System

Functional anatomy of kidney and the basic principles involved in the secretory and excretory function of kidney.

Evaluate the role of kidney in fluid and electrolyte homeostasis & acid-base balance.

The physiological basis of evaluation of renal functions in health and disease.

Principles of dialysis.

Physiological basis of diuretic action

Renal transplantation.

Skin & temperature regulation
SYLLABUS - PRACTICAL

1. Haematology
   Haemocytometry - Counts of various cells in the blood i.e. RBC, WBC, eosinophils, platelets and reticulocytes.
   Make, stain & report on a peripheral smear & do differential count of WBCs
   Haemoglobinometry, PCV, ESR, Blood Indices.
   Blood grouping – ABO & Rh typing
   Determination of bleeding time & clotting time
   Haemolysis & fragility tests (Demonstration only)

2. Nerve Muscle Physiology
   All the laboratory exercises done by undergraduate students in nerve muscle
   Physiology – Skeletal muscle, cardiac muscle & smooth muscle (Graph discussion)
   Ergography
   EMG & Nerve conduction studies (Demonstration only)

3. Nervous system & Special senses
   Examination of higher functions
   Examination of sensory system
   Examination of motor system
   Examination of cranial nerves
   Examination of reflexes
   Examination of nervous system in a patient with nervous system disorder & interpret the data obtained.
   EEG (Demonstration only)
   Perimetry
   Tests for hearing & deafness interpretation

4. Cardiovascular system
   Examination of cardiovascular system in a normal person.
   Determination of arterial blood pressure & its variation with posture & exercise
   Recording of arterial pulse using physiograph
   Recording of normal ECG in 12 leads
Echocardiography & treadmill test (Demonstration only)

5. **Respiratory system**
   Examination of respiratory system in a normal person.
   Recording of respiratory movements – normal & after exercise, using stethograph & Spirometer & interpretation of data obtained.
   Peak expiratory flow meter studies

6. **Endocrinology & Reproduction** (Chart discussion only)
   Evaluation of a patient with endocrine disorder
   Determination of ovulation time by basal body temperature chart, cervical smear & vaginal smear
   Pregnancy diagnostic tests – Immunological test (Demonstration only)

**TEXTBOOKS RECOMMENDED**

1. **Prescribed Books** -
   3. Understanding Medical Physiology: R.L. Bijalani- Jaypee Brothers
   5. Text book of Practical Physiology: Ghai

2. **Reference Books** –
   1. Best and Taylor’s Physiological Basis of Medical Practice: J.B. West (Ed)
      William & Walkins.
   2. Physiology: Berne & Levy
   5. Williams Text book of Endocrinology
   6. Clinical Haematology: Wintrobe’s
7. De Gruchy’s Clinical Haematology in Medical Practice
8. Text Book of Biochemistry: Dr. D.M.Vasudevan & Dr.Sreekumari
9. Harper’s Text Book of Biochemistry
10. Hutchinson’s Clinical methods

RESEARCH
Each candidate has to work on a particular topic for thesis, submission of which shall be as per University regulations. The thesis should be brief, clear and focus on the relevance of the topic & should be under the following sub-headings
1. Title
2. Introduction
3. Review of literature
4. Materials & methods
5. Observations
6. Discussion
7. Summary & conclusion
8. Bibliography
9. Appendix – tools used for data collection like questionnaire etc
It should be submitted to the University at least 3 months before commencement of final University examination.

LOG BOOK & RECORD BOOK –
Candidate has to maintain a journal, duly certified by the teacher, in which all the practicals done by him/her are recorded
Candidate will also maintain work diary/log book & record his/her participation in all day to day training programs conducted by the department. Attendance in CME’s, conferences, seminars & other academic programs are to be entered in this.
The journal & logbook must be scrutinized & certified by the Head of the department.

TEACHING OF UG STUDENTS –
During training period, the candidate should actively involve themselves in teaching programs for undergraduates, both theory & practicals

ADMINISTRATION –
They should be able to organise the laboratories for the conduction of various practicals.

Handle and order equipment for the stores, draw up lists of equipments required to equip any section of physiology.

**TEACHING-LEARNING METHODOLOGY –**

Group Discussions

Attending Lectures/Demonstration

Conducting / Attending seminars & Journal clubs

Conducting / Attending Practical demonstrations for UG students and Paramedicals

Practical exercises

Microteaching sessions

**EXAMINATION PATTERN**

**Theory - 4 papers – 100 marks each Total - 400 marks**

**Topic distribution for theory -**

- **Paper I** - General Physiology, Haematology, Cardiovascular system
- **Paper II** - Physiology of Respiration, Renal Physiology, Skin & temperature Regulation, Principles of Biophysics as applied to Physiology
- **Paper III** - Nervous system, Special senses, Muscle & nerve Physiology
- **Paper IV** - Gastro intestinal Physiology, Endocrine system, Reproductive system, Recent advances in Physiology

**Question paper pattern -**

Each paper - 3 Hours duration

- **Essay** 2 x 20 = 40 marks
- **Short Essays** 5 X 10 = 50 marks
- **Short notes** 2 X 5 = 10 marks

**Total** 100 marks
### Practical exam –

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<tr>
<td>Clinical Examination of subject provided</td>
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<td>Hematology</td>
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<td>Human Physiology</td>
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<td>Graph Discussion (Amphibian &amp; Mammalian)</td>
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<td>Chart discussion (Clinical Cases, Interpretation of data, Charts etc)</td>
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### Day 2

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<td>Micro Teaching</td>
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<td>Theory Viva</td>
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A candidate securing separate minimum of 50 % in theory and practical Is eligible to pass the examination. Those securing 75% and above are eligible for distinction.

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MD Physiology examination

Model Question Paper

Paper I

General Physiology, Haematology & Cardiovascular system

Max marks 100

Draw neatly labeled diagrams wherever necessary. Leave first page blank for mark distribution

I. Describe the blood supply of heart. Give an account of the pathophysiology of ischaemic heart disease

(10+10=20 marks)

II. Discuss the indications for transfusion of blood and blood products. Explain the signs and symptoms of mismatched blood transfusion, giving their physiological basis.

(10+10=20 marks)

III. Discuss the following -

A. Compensatory mechanisms during hypovolemic shock
B. Clinical applications of bioelectric potentials
C. Active transport across cell membrane & their inhibitors
D. Role of lymphocytes in immune mechanism
E. Regulation of heart rate

(10 marks X5=50 marks)

IV. Write briefly on -

A. Osmosis
B. Functions of platelets

(5 marks X2=10 marks)

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MD Physiology examination
Model Question Paper
Paper II

Max marks 100

Draw neatly labeled diagrams wherever necessary. Leave first page blank for mark distribution

I. Explain the mechanism of oxygen transport to tissues. Explain the various causes of hypoxia. What is oxygen toxicity?

(10 + 6 + 4 = 20 marks)

II. Describe the mechanism and significance of renal H⁺ ion secretion and buffer systems in renal tubular fluid.

(20 marks)

III. Discuss the following -
A. Renal function tests & their clinical significance
B. Role of skin in body temperature regulation
C. Acclimatization to high altitude
D. La Place’s law as applied to pulmonary and renal function
E. Ventilatory responses to PO₂, PCO₂ & pH changes & their interrelationship

(10 marks X 5 = 50 marks)

IV. Write briefly on -
A. Physiological applications of Donnan’s membrane equilibrium
B. Ventilation perfusion ratio & its significance

(5 marks X 2 = 10 marks)

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MD Physiology examination

Model Question Paper

Paper III

Max marks 100

Draw neatly labeled diagrams wherever necessary. Leave first page blank for mark distribution.

I. Describe the physiology of maintenance of muscle tone and its alterations in Pyramidal & extra pyramidal diseases. (10+10=20 marks)

II. Describe the mechanism of secretion, circulation and re absorption of aqueous humor. How is normal intra ocular pressure maintained? What is glaucoma? (10+5+5=20 marks)

III. Discuss the following
A. Drugs acting on neuro-muscular junction and the mechanism of action of each
B. Synaptic plasticity
C. Role of internal ear in detection and differentiation of sound
D. Formation, circulation, absorption and functions of cerebrospinal fluid
E. Features of hemisection of spinal cord and their physiological basis (10 marks x5=50 marks)

IV. Write briefly on
A. Mechanism of contraction of smooth muscle
B. Signal transduction in taste buds (5marksx2=10marks)
MD Physiology examination
Model Question Paper
Paper IV

Endocrinology, Reproduction, GIT & Recent advances

Max marks 100

Time 3 hours

Draw neatly labeled diagrams wherever necessary. Leave first page blank for mark distribution

I   Discuss the physiological role of hormones secreted by adrenal cortex. Write a note on diagnosis & management of Addison’s disease

(15+5=20marks)

II   Describe the endocrine & exocrine functions of pancreas. What are the effects of dysfunction of pancreas?

(10+10=20 marks)

III Discuss the following –

A Describe the physiological processes leading to ovulation. Add a note on tests for ovulation & their significance

B Outline the events occurring during digestion and absorption of fat in GIT

C Discuss the systemic actions and regulation of secretion of thyroid hormones

D Describe gametogenesis in male & its regulation
E Explain the physiology of deglutition. Outline the causes of dysphagia

(10 marks each x 5 = 50)

IV Write briefly on –

A In Vitro fertilization (IVF)

B Prostaglandins

(5 marks each x 2 = 10)

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