

Scheme for First Prof. MBBS Examination in Physiology**A. Written Paper****Paper I:** 1. General Physiology 2. Nerve muscle Physiology 3. Blood

4. G.I System 5. Respiratory System 6. Cardiovascular System

Paper II: 1. Endocrine system 2. Reproductive System 3) Excretory system
4. Nervous System 5. Special sense.

The four questions in each theory paper will preferably have the following distribution of marks.

Q. 1) One long essay type question (out of two) consisting of 2-4 small segments.

Marks for each segment will be indicated separately.

Marks may be 12.

Q. 2) Two short essay type question (out of three), each consisting of 2-3 small segments and marks for each segment will be indicated separately. Marks may be 14 (7 x 2).

Q. 3) Four short notes (out of five).

Marks may be 12 (3 x 4)

Q. 4) Four short clinically oriented explanatory notes (out of four).

Marks may 12 (3 x 4)

Answer to each question is to be given by the candidates in a separate answer book

B. Oral/Viva

Total marks –20

i) Topics of 1st paper-10 marksii) Topics of 2nd paper-10 marks**C. Practical**

Total marks-40

1. Haematology

Major- (TLC/TEC/DLC) -8 marks

Minor-(BT&CT/HB%/Blood group) -4 marks

2. Instruments/ Mammalian exp.(Dales, Long extension, ECG, Spiro meter, Charts, BMR) -2x6=12 marks

3. Human physiology -2x6=12 marks

4. Amphibian exp. (instruments and charts) -4 marks

D. Internal Assessment Marks:

Total marks-40

Question pattern in written examination of Periodical institutional Assessment-

Questions will be of short answer type and clinically oriented. At least 20% of the marks should be allotted to questions on applied aspects. The number of questions in the written test will be four (4) preferably having the following distribution of marks.

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MODEL QUESTIONS (1 st Prof MBBS)**PHYSIOLOGY****1st PAPER****TIME : 2 ½ hours****Full Marks : 50****Answer all questions****Group A**

1. Define hypoxia. Classify it and give one example of each type. Discuss acclimatization in high altitude. 2+4+6

OR

Define immunity. Compare and contrast between innate and acquired immunity. Give a short account of humoral immunity. 2+4+6

Group B

2. Answer **any two** of the following :
- a) Describe the molecular mechanism of skeletal muscle contraction. What is rigor mortis?
5+2
 - b) Describe how HCl is secreted by cells in the gastric mucosa. What is mucosal barrier?
4+3
 - c) Briefly describe oxy-hemoglobin dissociation curve. Mention the factors which shift the curve to the left. 5+2

Group C

3. Write short notes on the following (**any four**) : 4x3
- a) Exocytosis b) Chemoreceptors c) Conducting system of the heart

- d) Venous return e) Phagocytosis

Group D

4. Explain the following statements : 4x3

- a) Fatty meal delays gastric emptying.
- b) Left ventricle gets more blood supply in diastole.
- c) Oral Vit. B₁₂ cannot cure pernicious anemia.
- d) Urobilinogen is absent in complete biliary obstruction.

PHYSIOLOGY**2nd PAPER****TIME : 2 ½ hours****Full Marks : 50****Answer all questions****Group A**

1. What are the functional divisions of the cerebellum? Mention their functions. List the clinical features of cerebellar dysfunction. 2+5+5

OR

Discuss the biosynthesis of thyroid hormones. What are the features of hypothyroidism in an adult? 7+5

Group B

2. Answer **any two** of the following :

- a) What are the factors controlling spermatogenesis? What is in vitro fertilization? 5+2
- b) How is sodium reabsorbed in the renal tubule? What is glomerulo-tubular

balance? 5+2

- c) Name the photosensitive pigments in the retina. Describe the sequence of events involved in phototransduction in the retina. 2+5

Group C

3. Write short notes on the following (**any four**) : 4x3

- a) Pregnancy tests b) Referred Pain c) REM sleep
d) Cushing's Syndrome e) Brown – Sequard Syndrome

Group D

4. Explain the following statements : 4x3

- a) Near point recedes throughout life.
b) Glycosuria occurs when blood glucose level exceeds 180 mg/dl in venous blood.
c) Bradykinesia occurs in Parkinson's disease.
d) Insulin lowers blood sugar level.

SYLLABUS for First professional M.B.B.S. in Physiology including Biophysics

1. General physiology & Biophysics

06 hrs.

- Molecular structure of cell membrane and its functions. Types of transport across cell membrane.
- Intercellular connections.
- Resting membrane potential and Action potential.
- Homeostasis.
- Physical principles governing flow of blood in heart and blood vessels (*to be taught with CVS*).
- Physical principles governing air flow in respiratory passage (*to be taught with Respiratory System*).

2. Nerve muscle physiology:

08 hrs.

- Neurone: Structure, degeneration, regeneration, denervation hypersensitivity, electrogenesis of action potential.
- Neuromuscular transmission and its clinical application.
- Functional anatomy of skeletal muscle. Mechanism of muscle contraction and relaxation, contracture, rigor mortis, isotonic & isometric contraction, energy sources and metabolism, motor unit, size principle, recruitment.
- Type of smooth muscle and mechanism of contraction.

3. Blood:**20 hrs.**

- Composition and functions of blood.
- Plasma protein- types, origin, functions, applied importance
- R.B.C- morphology, erythropoiesis, functions, fate
- ESR and its clinical importance
- Haemoglobin- structure, types, compounds of haemoglobin, abnormal haemoglobin, RBC indices-PCV, MCV, MCH, MCHC, Colour index.
- Anaemia-Types with examples
- Polycythaemia
- Iron metabolism
- WBC Types, morphology, leucopoiesis, functions
- Immunity: Humoral & cellular, mechanism of immune response, immunoglobins,
- Monocyte - Macrophage system
- Platelets: structure and functions
- Haemostasis: Role of platelets, Blood coagulation, ant clotting mechanisms, anticoagulants.
- Bleeding disorders: Purpura, Hemophilia, Vitamin k deficiency, Tests for bleeding disorders,
- Thrombosis disorders: Thrombosis, Embolism
- Blood group: different systems, Blood grouping & cross matching and clinical importance.
- Blood transfusion: Hazards of blood transfusion, storage of blood.

4. Gastrointestinal System :**14 hrs.**

- Characteristics of G.I wall
- Neural control of G.I function
- G.I. hormones
- Saliva: Composition, Functions, control of secretion.
- Gastric juice: Composition, mechanism of secretion, functions, regulation of secretion, mucosal barrier, peptic ulcer, gastrectomy, Dumping Syndrome,
- Pancreatic juice: Composition, function, and regulation-applied importance.
- Liver and gall bladder: Compositions and functions of bile control of secretion, functions of gall bladder, gall stones, enterohepatic circulation, jaundice, functions of Liver and L.F.T.
- Small intestine: Composition, regulation of secretion, and functions of intestinal juice.

- Large intestine: Functions.
- Movements of G.I. tract: Mastication, deglutition, gastric motility and emptying, intestinal motility with reference to BER, small bowel wave, peristalsis, paralytic illius defaecation.

5. Respiratory system:**16 hrs.**

- Functional anatomy and functions of respiratory system.
- Mechanics of respiration.
- Lung volumes and capacities: definitions, normal values, their measurement and clinical importance.
- Pulmonary ventilation. Alveolar ventilation, Dead space.
- Diffusion of gases across alveo-capillary membrane, diffusing capacity.
- Pulmonary circulation.
- Oxygen & carbon dioxide transport in blood.
- Pressure changes during ventilation, pressure volume relationship including surfactant and compliance, airway resistance, work of breathing.
- Control of respiration: neural control, chemical control, response to exercise, periodic breathing.
- Hypoxia including high altitude physiology and acclimatization, asphyxia, cyanosis, oxygen therapy and toxicity.
- Effects of increased barometric pressure-nitrogen narcosis, high pressure nervous syndrome, decompression sickness (Caissons disease).
- Artificial respiration.
- Lung function tests.

6. Cardio-vascular system:**22 hrs.**

- Functional anatomy of heart and blood vessels.
- Properties of cardiac muscle.
- Origin and spread of cardiac impulse, heart block, cardiac arrhythmias.
- ECG: leads, principles of normal recording, normal waves, & their interpretations, electrical axis of the heart including left and right axis deviation, clinical uses of ECG.
- Cardiac cycle: Mechanical events, Pressure changes in atria, ventricles, aorta, pulmonary artery and jugular vein. End diastolic volume, End systolic volume, Ejection fraction.
- Heart sounds: normal character, physiological basis of splitting, murmur.
- Cardiac output: Definition, Determination, Factors regulating, Venous return.
- Arterial pulse: normal & abnormal.
- Physical principles governing flow of blood in heart & blood vessels, laminar flow, turbulent flow, Reynolds number, peripheral resistance, Poiseuille-Hagen formulae.

- Arterial pressure: total pressure, lateral pressure, Bernoulli's principle, Importance of different pressure measurement, Factors controlling B.P, Effects of gravity, Posture and Exercise on B.P, Hypertension & hypotension
- Regulation of CVS: local regulation including auto regulation of blood flow, vasoconstrictors & vasodilators, substances secreted by endothelium including NO, systemic regulation- humoral & neural, innervations of heart and blood vessels, cardiovascular centres, cardiovascular reflexes, regulation of B.P & heart rate.
- Regional circulation: coronary circulation, cutaneous circulation, pulmonary, cerebral, renal circulation will be taught in respective systems.
- Cardio-vascular adjustments in health & disease: effects of exercise, haemorrhage & shock.

7. Endocrine system:**20 hrs.**

- General organization of endocrine glands & control system
- Mechanism of hormone action.
- Biosynthesis, regulation of secretion, transport, fate and actions of hormones secreted from. Hypothalamus, Pituitary, Thyroid, Adrenal cortex, Adrenal medulla, Parathyroid (along with calcium metabolism) and endocrine pancreas, importance to be given to clinical conditions associated with hypo and hyper functions of these glands.

8. Reproductive system**10 hrs.**

- Sex differentiation and development of Reproductive system
- Aberrant sexual differentiation, chromosomal abnormalities, developmental abnormalities
- Puberty, precocious and delayed puberty
- Climacteric.
- Male reproductive system: Spermatogenesis, endocrine functions of testis, abnormalities of testicular function, cryptorchidism, male hypogonadism, and sterility.
- Female reproductive system: ovary, oogenesis, ovulation, corpus luteum, ovarian hormones- estrogens, progesterone, relaxin, control of ovarian functions by hypothalamic and pituitary hormones.
- Menstrual cycle: ovarian cycle, uterine cycle, hormonal basis, abnormalities of menstruation, infertility
- Pregnancy: Fertilization, implantation, placental hormones, pregnancy tests, parturition.
- Lactation
- Contraception.

9. Excretory System:**12 hrs.**

- Functional anatomy of kidney, nephron-structure, parts, function, types.
- Juxtaglomerular apparatus: autoregulation, peculiarities, measurements.
- Renal circulation: Auto regulation, peculiarities, and measurement

- Glomerular filtration: filtration barrier, forces governing filtration, measurement.
- Tubular functions: re-absorption, secretion, Tm values
- Regulation of ECF-volume, osmolality and electrolytes
- Micturition
- Renal function tests, renal clearance, abnormal constituents of urine
- Excretory functions of skin

10. Nervous system:**22 hrs.**

- Organization of nervous system, functional anatomy of brain and spinal cord, neuron, neuroglia
- Cerebral circulation, CSF, blood-brain barrier
- Synapse- types, properties, synaptic transmission, neurotransmitters
- .Sensory receptors: classification, generator potential, properties,
- Reflex action: definition, reflex arc, stretch reflex, inverse stretch reflex, withdrawal reflex
- Sensory system: touch, pain, temperature, vibration, proprioception, ascending tracts, sensory cortex
- Pain: types, visceral pain, pain inhibiting mechanism, gating of pain, opioids, analgesia, hyperalgesia, thalamic syndrome
- Motor system: motor cortex, descending tracts-pyramidal & extra pyramidal tracts, upper motor neurone lesion, lower motor neurone lesion, hemiplegia, paraplegia, monoplegia.
- Injuries of spinal cord: complete transaction, hemi section., Tabes dorsalis, syringomyelia, section of anterior root & posterior root.
- Cerebellum: structure, parts, connections, functions, features of cerebellar lesion.
- Basal ganglia: components, connections, functions, applied.
- Muscle tone, posture, equilibrium, regulation of muscle tone & posture, vestibular apparatus.
- Autonomic nervous system: organizations and functions.
- Hypothalamus: structure & functions, temperature regulation.
- Physiology of thalamus, reticular formation, RAS.
- EEG, sleep and wakefulness.
- Physiology of limbic system.
- Higher functions of the brain: learning & memory, speech.

11. Special Sense:**10 hrs.**

- Smell: receptor, pathway.
- Taste: taste buds, pathway.
- Vision: structure of eyeball, structure of retina, visual pathway and effects of lesion, image forming mechanism, light reflex, accommodation, errors of refraction, electrophysiology of eye, colour vision, colour blindness, dark adaptation.

- Hearing: functional anatomy of the ear, functions of middle ear, Organ of corti, hair cell physiology-endocochlear potential, auditory pathway, sound localization, pitch discrimination, deafness.

Practical Physiology**60 hrs.****1) Haematology:**

- a) Compound microscope.
- b) Preparation of blood film
- c) Staining with Leishman's stain
- d) Identification of blood cell
- e) Differential count of WBC
- f) Total count of WBC.
- g) Total count of RBC.
- h) Haemoglobin estimation.
- i) Total count of platelets.
- j) Blood grouping.
- k) Bleeding time and clotting time.
- l) Haemin crystal.
- m) Demonstration of: PCV, ESR, Osmotic fragility, Prothrombin time.

2) Amphibian Practicals:**20 hrs.**

- a) Demonstration of instruments related to amphibian nerve muscle and heart experiments.
- b) Demonstration of experiments:
 - 1) Effect of signal induction shock.
 - 2) Effect of two successive stimuli.
 - 3) Effect of temperature on simple muscle curve.
 - 4) Stannius ligature.
 - 5) Effect of load on simple muscle curve.
 - 6) Recording of normal cardiogram.
 - 7) Effect of temperature on heart.
 - 8) Stimulation of vagus and vagal escape.
 - 9) Effects of drugs on heart-Acetylcholine, adrenaline.
 - 10) Effect of repeated stimuli for genesis of clonus and tetanus.

3) Mammalian Practicals:**10 hrs.**

- a) Dale's tissue organ bath for record of intestinal movements and effects of drugs.
- b) Demonstration for the record of BP and respiration by long extension kymograph:

- 1) Normal record.
- 2) Effect of common carotid artery occlusion.
- 3) Effect of adrenalin, noradrenalin, acetylcholine.

4) Human Physiology Practicals:
70 hrs.

- Clinical examination of respiratory system: vocal fremitus, vocal resonance, breath sounds.
- Clinical examination of CVS: Arterial pulse, apex beat, heart sounds, recording of blood pressure and effects of posture and exercise on Blood Pressure.
- Clinical examination of nervous system:
 - 1) Examination of cranial nerves. 2) Examination of sensory system.
 - 3) Examination of motor system-examination of superficial and deep reflexes, examination of muscle tone and power.
- Spirometry- Measurement of lung volumes and capacities.
- Stethography- Effect of breath holding and deglutition on respiration.
- Measurement of BMR.
- Demonstration of ECG, EEG, EMG, Ophthalmoscope, bicycle ergometer and arterial blood gas analysis

Lecture	:160 hrs.
Practical	:160 hrs.
Tutorial including Group discussion, Seminar, Items	:160 hrs.

TOTAL	480 hrs.
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1st Semester Lectures- Topics of Paper I

2nd Semester Lecture - Topics of Paper II

Practical :
1st Semester
2nd Semester

1. Haematology- Practical

1. Mammalian-Practical

2. Amphibian-Practical

2. Human Physiology-Practical

Tutorial: Group Discussion-98 hrs.
Seminars- 6x2 hrs.
Item- 50 hrs.

Total No. of weeks : **37 weeks** **Per week allotment** : **13/13.5 hrs.**

Lecture : 4.5/ 4 hrs. **Practical** : 5 hrs **Tutorials** : 4 hrs.

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