

Syllabus for HUMAN PHYSIOLOGY

INDEX

Sr. No	Item	Page No.
1	Broad Curriculum as per MCI Guidelines for Human Physiology	42-43
2	Syllabus of Human Physiology	44-45

BROAD CURRICULUM AS PER MCI GUIDELINES HUMAN PHYSIOLOGY INCLUDING BIO – PHYSICS

(A) PHYSIOLOGY

i) GOAL

The broad goal of the teaching of undergraduate students in Physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

ii) OBJECTIVES

a) KNOWLEDGE

At the end of the course the student will be able to:

- (1) Explain the normal functioning of all the organ systems and their interactions for well coordinated total body function.
- (2) Assess the relative contribution of each organ system to the maintenance of the milieu interior.
- (3) Elucidate the physiological aspects of normal growth and development.
- (4) Describe the physiological response and adaptations to environmental stresses.

- (5) List the physiological principles underlying pathogenesis and treatment of disease.

b) SKILLS

At the end of the course the student should be able to:

- (1) Conduct experiments designed for study of physiological phenomena.
- (2) Interpret experimental/investigative data.
- (3) Distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

c) INTEGRATION

At the end of the integrated teaching the student should acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

(B) BIOPHYSICS

- (a) **GOAL & OBJECTIVES:** The broad goal of teaching Biophysics to undergraduate students is that they should understand basic physical principles involved in the functioning of body organs in normal and diseased conditions.

Total time for teaching Biophysics = 5 hours

Out of which:

1. Didactic lectures	=	3 hours
2. Tutorial/group discussion	=	1 hour
3. Practical	=	1 hour

(b) Topic distribution

(1) Lectures:

- (i) Physical principles of transport across cell membranes and across capillary wall.
- (ii) Biopotentials.
- (iii) Physical principles governing flow of blood in heart and blood vessels.

Also physical principles governing flow of air in air passages.

2. Tutorial/group discussion: On the topic covered in didactic lectures.

3. Practical's:

Demonstration of:

- a) Biopotential on oscilloscope
- b) Electro Encephalogram (EEG)
- c) Electro Myelogram (EMG)
- d) Electro Cardiogram (ECG)

FIRST M.B.B.S. - SYLLABUS

HUMAN PHYSIOLOGY

I) GOAL

The broad goal of the teaching of undergraduate students in physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and diseases.

II) EDUCATIONAL OBJECTIVES:

1) At the end of the course, the student will be able to: describe the normal functions of all the organ systems, their regulatory mechanisms and interactions of the various systems for well-coordinated total body function.

2) Understand the relative contribution of each organ system in the maintenance of the milieu interior (homeostasis).

3) Explain the physiological aspects of normal growth and development.

Analyse the physiological responses and adaptation to environmental stresses.

4) Comprehend the physiological principles underlying pathogenesis and treatment of disease.

5) Correlate knowledge of physiology of human reproductive system in relation to National Family Welfare Program.

III) SKILL :

At the end of the course the student shall be able to :

1) Conduct experiments designed for study of physiological phenomena.

2) Interpret experimental/investigative data.

3) Distinguish between normal & abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

IV) INTEGRATION :

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

V) COURSE CONTENT :

Theory

List of topics.

A) GENERAL PHYSIOLOGY. (5 hours)

Must know.

- Introduction to Physiology
- Branches of Physiology
- Functional organization of human body.
- External and internal environment
- Homeostasis, Biofeedback mechanisms

Cell Physiology:

- Transport across cell membrane.

B) HEMATOLOGY : (15 hours)

Must know

- Composition of blood
- Functions of blood
- Plasma proteins: Types, concentration, functions.
- Erythrocytes: Morphology, functions, normal count physiological variations in normal count & anaemia, polycythemia.
- Haemopoiesis: general concepts
- Erythropoiesis: stages, Sites, regulation, reticulocyte & its clinical significance.
- Haemoglobin: Functions, normal values, physiological variations.
- Fate of erythrocytes: life span, Catabolism of Hb, bilirubin metabolism, jaundice.
- Physiological basis of anaemia, nutritional anaemia.
- Polycythemia: Primary & secondary.

- Leukocytes: differences between R.B.C. & W.B.C., types of W.B.C.s
normal count & differential W.B.C. count, physiological variations,
properties, functions of W.B.C.s,,
Granulopoiesis – stages, regulation,
Lymphopoiesis.
Pathological variations in total & differential W.B.C. count.
- Immunity: definition, concept of antigen & antibody, types of immunity-
Innate & Acquired, & their mechanism, cell mediated & humeral
immunity, B lymphocytes, T lymphocytes & their types.
Primary & secondary response, basis of vaccination.
- Blood groups: Landsteiner's law,
ABO System – type A & B antigen, ABO system & inheritance, relation to
transfusion, cross matching major & minor.
Rh System – inheritance, Rh incompatibility & blood transfusion,
Erythroblastosis foetalis.
- Blood transfusion: indications, storage of blood & changes during storage,
transfusion reactions.
- Monocyte - macrophage system: Classification, functions, functions of
spleen.
- Hemostasis: definition, basic mechanisms of Hemostasis,
- Platelets: structure, normal count & variations, functions, role in platelet
plug formation, Hemostasis & clot retraction.
- Blood coagulation: Coagulation factors in plasma, basic mechanism of
blood clotting, intrinsic & extrinsic pathways & difference between two
pathways, role of calcium in coagulation, role of vitamin K, fate of clot.
Anticoagulants – commonly used & their mechanism of actions,
blood coagulation tests – bleeding time, clotting time.
Haemophilia.
- Body fluid compartments: role of water in body & its distributions,
different body fluid compartments & composition of their fluid.

- Blood volume: normal value, physiological & pathological variations, blood volume regulation in detail (To be taken at end of lectures on C.V.S, kidney and endocrines)

Desirable to know

- Physical properties of blood.
- Plasma proteins: Plasmapheresis, role of liver in plasma protein synthesis, relationship of diet & plasma protein synthesis.
- R.B.C.: advantages of biconcave shape.
- Bone marrow structure and cellular elements.
- Common Haemoglobinopathies (Hbs, Hbc, Thalassaemia)
- Method of determination of life span of R.B.Cs.
- Types of jaundice.
- Polycythemia – effects on haemodynamics,.
- Immunity: Antibody structure & types, antigen – antibody reactions.
- Blood group: M. N. system, other blood groups.
- Thrombocytosis, thrombocytopenia purpura.
- Anticoagulants: used in vitro & in vivo.
- Other blood coagulation tests.
- Classification of haemorrhagic diseases, D.I.C.
- Measurement of: total body water, blood volume, plasma volume, I.C.F. volume.

Nice to know

- Blood component therapy.
- Effects of splenectomy.
- Plasmin system.

C) NERVE (5 hours)

Must know:

- Distinctive histological features relevant to functions of nerve fibers.
- Classification of nerve fibers: based on structure, diameter, functions and only for sensory nerves.
- R.M.P. definition, production & maintenance, method of measurement, significance.
- Action potential: definition,
Phases – depolarization, repolarisation, ionic basis of depolarization & repolarisation.
Production & propagation of A.P.,
Properties of A.P., significance.
- Properties of nerve fibers.
- Strength duration curve: chronaxie and factors affecting it.
- Factors affecting conduction in a nerve.

Desirable to know:

- Experimental techniques to study the mechanism of production of R.M.P. & A.P.: patch clamp, voltage clamp
- Methods of recording of A.P.

D) MUSCLE (7 hours)

Must know.

- Classification of muscles,
- Structure of skeletal muscle:
Electronmicroscopic structure, muscle proteins – contractile, regulatory, structural & enzymatic.
Sarcoplasmic tubular system: concept of sarcoplasmic triads & their functions.
- Neuromuscular transmission: Physiologic anatomy, events, N-M blocking & its clinical significance, applied aspect – myasthenia gravis.

- Excitation – contraction coupling.
 - Molecular basis of skeletal muscle contraction: sliding filament theory, power stroke – cross bridge cycle, role of calcium.
 - Energetics: fuel used by skeletal muscle at rest & in exercise, metabolic pathways involved to yield A.T.P.,
- Oxygen debt: definition, types (lactic, alactic), incurring of debt, repaying the debt, significance.
- Properties of skeletal muscle: excitability, refractory period (absolute, relative), conductivity, contractility – types (isometric, isotonic), effects of summations (multiple motor unit summation, frequency summation & tetanizability), all or none law, extensibility & elasticity, fatiguability.
 - Factors affecting development of tension in the muscle:
 - a) number of motor units contracting- type of muscle, number of muscle fibers in each unit activated, supraspinal influences.
 - b) length – tension relationship
 - c) frequency of stimuli, duration of stimulation
 - d) load
 - e) type of contraction
 - f) Chemical composition of muscle fibers and ions.
 - E.M.G. (in brief)
 - Skeletal muscle circulation.
 - Smooth muscle: structure, distribution, types molecular mechanism of contraction, properties, regulation, and disorders.

Desirable to know

- Heat liberated during various phases of contraction, Fenn effect.
- Recording of muscle activity.

Nice to know

- E.M.G. details.

E) RESPIRATORY PHYSIOLOGY (15 hours)

Must know:

- Physiologic anatomy
- Functions of respiratory system, non respiratory functions of lung
- Mechanics of respiration:

Ventilation :

Inspiratory & expiratory muscles, intrapleural pressure, lung & thoracic compliance, factors affecting compliance, work of breathing, surface tension forces & role of surfactant, airway resistance, elastic resistance.

- Lung volumes and capacities. Measurement, physiological & significance (tidal volume, vital capacity, forced vital capacity – details)
- Pulmonary ventilation, alveolar ventilation, alveolar dead space, - applied aspect,

Maximum breathing capacity & breathing reserve.

Diffusion of Gases :

- Exchange of respiratory gases at alveolar – capillary membrane, factors affecting diffusion.

Gas Transport :

- Transport of oxygen, role of Haemoglobin, oxygen dissociation curve & factors affecting it.
- Transport of carbon dioxide

Control of Breathing :

Neural control – higher centers, reflexes.

Chemical control – central & peripheral chemoreceptors role of CO₂, O₂, H⁺

Pulmonary Circulation

- Characteristics
- Ventilation perfusion ratio
- Respiratory adjustment in exercise.
- Hypoxia: types & high altitude hypoxia.

- Artificial respiration:
- Pulmonary function tests - principles

Desirable to know.

- Method of determination of dead space, residual volume, functional residual capacity.
- Oxygen therapy: indications, hazards of hyperbaric oxygen & use.

Nice to know

- Concept of P_{50}
- Positive pressure breathing.

F) CARDIOVASCULAR PHYSIOLOGY (20 hours)

Must know:

- Introduction, functions & importance of the system.
- General organization.
- Structure of heart, pericardium, myocardium, endocardium, nerve supply, Histology, details of cell junctions, syncytium, contractile & conducting fibers.
- Properties of cardiac muscle: excitability, conductivity, contractility, autorhythmicity, all or none law, long refractory period.
- Junctional tissues of heart, pacemaker potential, action potential of cardiac muscle.
- Generation & conduction of cardiac impulse.
- ECG: lead arrangement, normal waves & their significance with reference to lead II
- Cardiac cycle: pressure – volume changes, heart sounds & their clinical significance, correlation of pressure, volume, ECG, heart sounds in cardiac cycle.
- Heart rate & its regulation.
- Haemodynamics - def., blood flow, resistance
- Cardiac output: normal values, physiological variations, factors affecting cardiac output – details, regulation, measurement – principles.

- Blood pressure:
Normal levels, measurement, determinants, short term & long term regulation - details.
- Capillary circulation, tissue fluid formation.
- Lymphatic system: Anatomy & structure, formation of lymph, composition of lymph, functions of lymphatic system, lymphflow & factors affecting it.
- Regional circulation: Physiologic anatomy, factors affecting, special features: coronary, cerebral , skin, portal
- Adaptation of cardiopulmonary system to various grades of exercise.
- Hemorrhagic shock – stages & compensatory mechanisms, effects on body, physiological basis of treatment in brief.

Desirable to know:

- Ion channel & receptors (physiological, pharmacological & clinical significance)
- E.C.G. – electrical axis of heart, heart blocks, arrhythmias, ischaemia, infarctions.
- Heart sounds: murmurs & their clinical significance.

Nice to know

- Experimental methods of studying cardiovascular physiology,
- Patho physiology of oedema

G) RENAL PHYSIOLOGY (10 hours)

Must know:

- General introduction, structure & functions of kidney.
- Renal circulation: special features from functional point of view.
- Concept of clearance: to study renal physiology, for :
 - a) GFR – Inulin, Creatinine, basic principle of radioisotope method.
 - b) Renal blood flow – PAH
 - c) Concentration & dilution of urine – free water.
- Formation of urine:
 - 1) Glomerular stage – GFR (definition, dynamics, factors affecting & measurement))
 - 2) Tubular stage – Reabsorption & secretion.
 - a) Sodium, potassium, glucose : details
 - b) Handling of water – concentration & dilution of urine.
 - c) Secretion of H^+
 - 3) Role of kidney in acid – base balance.
- Physiology of micturition: basic reflex & control, cystometrogram.
- Artificial kidney: basic principles of dialysis.

Desirable to know:

- Experimental studies for renal functions.

Nice to know

- Disorders of micturition.

H) BODY TEMPERATURE REGULATION: (2 hours)

Must know:

- Homeothermia – Balance between heat gain & heat loss.
- Regulation of body temperature,

Desirable to know:

- Hyperthermia, Hypothermia.

I) ALIMENTARY SYSTEM: (12 hours)

Must know:

- General introduction & organizational plan, innervations and blood supply.

Salivary secretion:

- General principles & basic mechanisms of secretion composition ,and functions of saliva, mechanism & regulation of salivary secretion.

Mastication and deglutition:

- Three phases of deglutition- physiologic anatomy, mechanism & control

Gastric secretion:

- Functional anatomy, histology, functions of stomach, composition of gastric juice, cellular mechanism of gastric secretion of acid, pepsin, intrinsic factor, other enzymes, phases of gastric secretion, regulation of gastric secretion.
- Gastric Motility:

Electrical activity of stomach, pylorus, emptying of the stomach-pyloric pump, regulation & factors promoting & inhibiting emptying.

Pancreatic secretion:

- Structure, composition & mechanism of secretion of electrolytes & enzymes, regulation of secretion.

- Liver & gall bladder:

Microscopic structure, functions of liver, composition of bile, cellular mechanism of bile formation, enterohepatic circulation of bile salts, control of secretion, concentration & storage of bile in gall bladder. filling & evacuation of gall bladder functions of gall bladder

Intestinal secretion:

- Structure, innervations.
- Composition & mechanism of secretion of small intestinal juice, regulation of secretion.
- Secretion of large intestine: mucous, water, electrolyte.
- Motility of small intestine:
Structure & innervation electrical activity of smooth muscle, resting membrane potential, slow waves, spike potentials, rhythmic segmenting contractions, peristalsis, control – neural & hormonal, functions of ileocecal valve.
- Motility of large intestine:
- Structure & innervation, 'mixing & mass movements, defecation reflex' and its control
- G.I. hormones: in brief.

Digestion & absorption:

- Digestion & absorption of
- carbohydrate,
 - Proteins
 - Fats

absorption of water, electrolytes and vitamins.

Desirable to know:

- Gastric mucosal barrier, experiments to study regulation of gastric juice secretion, disorders of secretion, peptic ulcer., inhibitors of gastric secretion
- Effects of vagotomy, abnormal gastric motility vomiting.
- Barium meal studies, endoscopy, biopsy.
- Pathophysiology of small intestinal motility, paralytic ileus, diarrhea, obstruction.
- Pathophysiology of colonic motility, irritable bowel syndrome, drugs, constipation.
- Pancreatic function tests.
- Gall stone, effects of removal of gall bladder

Nice to know

- Disturbances of esophageal motility, spasm, achalasia, hiatus hernia.
- Methods for study of intestinal absorption.
- Effects of hepatectomy.

J) NUTRITION: (2 hours)

Must know:

- concept of balanced diet
- factors affecting caloric requirements
- requirements of various nutrients, sources, daily needs.
- nutrition under special conditions – pregnancy, lactation, growing child.

K) ENDOCRINE SYSTEM (10 hours)

Must know:

- Introduction
- Endocrine functions of Hypothalamus – releasing hormones, Mechanism of hormone action
- Anterior pituitary hormones:
functions, regulation, disorders.
posterior pituitary hormones, ADH, Oxytocin. functions, regulation, disorders.

Thyroid:

hormone: synthesis, fate, functions, regulation, disorders.

- Parathyroid:

hormone: synthesis, functions, regulation, disorders – tetany.

- Adrenal cortex: and medulla.

hormone: secretion, functions, regulation, disorders

- Pancreatic hormones:

secretion, functions, regulation, disorders.

Desirable to know:

- Radioimmuno assays.

Nice to know

- Experimental studies.

L) REPRODUCTIVE PHYSIOLOGY: (8 hours)

Must know:

- Sex chromosomes, sex determination, sex differentiation
- Functional anatomy of reproductive system.
- Puberty: changes in males & females and its control.
- Spermatogenesis: stages & regulation

Semen analysis.

- Testosterone: actions & regulation.
- Male sexual act.
- Menstrual cycle & ovarian cycle:

Phases & hormonal regulation.

- Menopause.
- Ovulation: indicators & importance
- Fertilization, implantation of ovum.
- Functions of placenta
- Physiology of pregnancy;
- Maternal changes during pregnancy
- Parturition: in brief – stages and mechanism.
- Lactation: initiation & maintenance and control.
advantages of breast-feeding.
- Contraception: to be taken as integrated topic.

Desirable to know:

- Sex chromosomes: Barr bodies.
- Development of genitals & gonads

Nice to know

- Precocious & delayed puberty.

M) SPECIAL SENSES (8 hours)

Must know:

- Eye:

Functional anatomy of eye, optics, microscopic structure of retina with retinal circuits, image formation,

Photochemistry of vision (photopic & scotopic vision, dark & light adaptation),

Pupillary reflexes, Accommodation reaction, Errors of refraction and their correction, Colour vision – physiological & neural basis, accepted theory

of colour vision, classifications, basis of colour blindness and tests of colour blindness, significance.

Visual pathway – processing of information at different levels in visual pathway, organisation of visual cortex. Effects of lesion at different levels in visual pathway,

Movements of eyeballs: functions & control.

- Ear:

Physics of sound, decibel system,

Functions of external ear,

Functional anatomy of middle ear, functions of middle ear in detail, assessment of functions of middle ear, Functional anatomy of cochlea, functions of inner ear, place principle, theories of hearing.

- Audiometry,

Auditory pathway & important features, auditory cortex (role in hearing & speech development)

- Taste:

Functional anatomy of taste buds, different taste modalities, pathway, factors affecting taste sensation,

- Smell:

Functional anatomy of receptors, primary olfactory sensations, pathway, factors affecting smell sensation,

Desirable to know:

- Resolution of images,
- Electrophysiology of internal ear: cochlear micro phonics.

Nice to know

- Electrophysiology of retina.
- Theories of hearing.

N) CENTRAL NERVOUS SYSTEM: (50 hours)

Must know

- Outline of nervous system.

1) General nervous system:

Synapse: definition, physiological anatomy, sequence of events of synaptic transmission, properties, (state the property & its significance), significance of synaptic transmission, applied aspect.

Neurotransmitters – in brief.

Receptors: definition, classification (basis of each classification with example), properties (state each property with underlying mechanism & significance), significance (homeostasis, conscious awareness of environment, tone posture, protection).

Sensations: different modalities, classification with examples and significance

- sensation of touch, pain proprioception : details of each

Reflexes: definition, classification (basis of classification with example), reflex arc & its components, properties (state each property with basis & importance)

Stretch reflex – definition, muscle spindle (details with innervation, role of gamma motor neurons) role of supra spinal control – in brief, functions of stretch reflex (regulation of muscle tone) inverse stretch reflex.

Polysynaptic reflexes: withdrawal reflex.

2) Tracts:

Ascending & descending tracts: details of each tracts – (situation & extent in spinal cord, origin, course & termination, collaterals, somatotopic arrangement, functions, applied aspect, tests)

Ascending tracts: Basic plan of somato sensory pathway for conscious Sensation, pathway from head, face region.

Descending tracts: pyramidal tracts – details., extra pyramidal tracts, differences between UMN & LMN lesions.

2) Sections at various levels in CNS :

a) Spinal transection – spinal animal.

Complete – 3 stages – spinal shock, stage of recovery, stage of reflex failure – details of each stage.

Incomplete. Transection

Hemissection

b) Low midbrain section – decerebrate animal : Decerebrate rigidity.

(Classical & ischaemic with mechanisms, characteristics features, physiological significance)

c) High midbrain section – High decerebrate animal.

d) Thalamic or Decorticate animal.

3) Posture - & Equilibrium.

Definition, classification of postural reflexes.

(Details of each reflex and its function.)

regulation of posture (integrating centers at various levels of CNS)

vestibular apparatus : Physiologic anatomy, mode of function of utricle & saccule and semicircular canals, vestibulo ocular & vestibulo spinal reflexes.

4) Thalamus :

Functional classification of Thalamic nuclei, with connections of different nuclear groups, functions of thalamus, thalamic syndrome.

5) Hypothalamus :

Functional classification of different hypothalamic nuclei, connections in brief, functions in details.

6) Limbic system :

Parts of limbic system, connections in brief, functions.

7) Reticular formation :

Introduction, anatomy in brief, functional divisions.

(A) Ascending reticular activating system – details with connections & role in sleep wakeful cycle, applied aspect.

(B) Descending reticular system – role in regulation of muscle tone by pontine & medullary regions.

(C) Visceral centres.

8) E. E. G. :

Definition, different waves, characteristics & functional significance of each wave, physiological variation, clinical application in brief.

9) Sleep & Wakefulness :

Concept of alertness & wakefulness with their physiological basis, Definition of sleep, stages of sleep correlated with EEG, sleep cycle – types of sleep, salient features of NREM & REM sleep, physiological effects of sleep on different systems of the body, Neurophysiological mechanisms of sleep, functions of sleep.

10) Cerebellum :

Introduction, functional classification, intracortical circuit, deep cerebellar nuclei, connections of different lobes, functions of cerebellum, cerebellar function tests, effects of lesion in brief.

11) Basal Ganglia :

Introduction, classification of nuclei, connections, intracortical circuits, functions, lesions - Parkinsonism.

12) Cerebral Cortex :

Gross anatomy & divisions, concept of Brodmann's mapping with diagram, Parietal lobe – anatomical & functional divisions, details of each functional part as regards connections, topographic organisation, functions. Frontal lobe – excitomotor Cortex – anatomical & functional parts, details of each part as regards connections, topographic organisation, functions.

Prefrontal Cortex – different areas, connections in brief, functions, effects of lobectomy.

13) speech –

Afferent and efferent mechanisms and role of cortical centers in speech, concept of cerebral dominance, development of speech, vocalization.

14) Memory :

Definition, stages, types, physiological basis, factors affecting, applied – amnesias in brief.

15) Learning :

Definition, types with examples, stages, factors influencing, role of motivation (positive & negative reinforcement, reward & punishment), physiological basis – role of different parts of CNS, structural, biochemical changes.

16) Conditioned reflexes :

Definition, difference between unconditioned & conditioned reflexes, development of conditioned reflexes, properties, significance.

17) Autonomic nervous system :

Organization and functions of Parasympathetic & Sympathetic and their control.

18) CSF :

Introduction, composition, normal CSF pressure, formation & circulation, functions, applied aspect – brief, blood brain barrier, blood CSF barrier.

19) “ Physiology of Brain Death & changes after that ” (This topic included vide Academic Council Resolution No. 303/2008 dated 29/07/2008)

<p><u>Introduction of “ Brain Death and Organ Donation” topic in subjects of Physiology , Preventive & Social Medicine, Psychiatry, Medicine & Surgery</u></p>
--

Desirable to know :

General nervous system :

Neurotransmitters – details, susceptibility of synapse to hypoxia drugs etc.,
Mechanisms of referred pain, differences between superficial & deep pain,
central analgesia system, supraspinal control of stretch reflex – details.

Thalamus - applied aspects – effects of lesions.

Hypothalamus - applied aspects – effects of lesions

Reticular formation – effects of lesion

EEG – Method of recording, abnormal patterns.

Basal Ganglia – lesions, involuntary movements.

Cerebellum – Embryology, evolution, effects of stimulation & ablation.

Cerebral cortex – effects of stimulation & ablation in different regions.

Speech – aphasias.

Nice to know

Experimental studies – effects of stimulation & ablation.

Sleep, wakefulness – effects of sleep deprivation, disorders.

Books recommended:

1) Textbooks of Physiology :

- | | | |
|-----------|---|------------------------------|
| Guyton | - | Textbook of Physiology |
| Ganong | - | Review of Medical Physiology |
| S. Wright | - | Applied Physiology |

2) Reference Books :

- | | | |
|-----------------|---|---|
| Best and Taylor | - | Physiological basis of medical practice |
| Berne & levy. | - | Principles of Physiology |
| Dr. V.G. Ranade | - | Laboratory Manual and Journal of Physiology
Practicals |

(A) Haematology

Hb% R. B. C. W. B. C. Differential, B.T.C.T. Blood group, ABO system Rh typing, Blood Indices

(B) Clinical examination and Human experiments

Stethography, Spirometry, Ergography, Perimetry, Tests for physical fitness, Clinical examination of all systems.

(C) Demonstrations

Reticulocyte count. Platelet count, P. C. V., E. S. R, fragility, peripheral blood smear, bone marrow slides,

E.M.G. S.D. curve, conduction velocity of nerve (Human), E.C.G., E.E.G., Audiometry, H.R.T. (Human reaction time)

Visit to blood bank, wards to show common disorders or video tapes (list given in appendix I), X-rays (list given in appendix II)

Animal experiments on frogs,

a) Skeletal muscle:

effect of graded stimuli,

simple muscle twitch

genesis of tetanus,

effect of load on skeletal muscle

fatigue.

“Velocity of Nerve Impulse & Effect of Two Successive Stimuli in Skeletal Muscle” (his two expt. Is added in new syllabus vide academic council resolution No. 64/2009 dated 28/04/2009)

Introduction of “ Velocity of Nerve Impulse & Effect of Two Successive Stimuli in Skeletal Muscle Topic in 1st MBBS Practical Syllabus

b) Cardiac muscle.

normal cardiogram, effect of temperature,

properties of cardiac muscle,

effect of vagal stimulation and phenomenon of vagal escape.

effect of drugs (Acetyl choline, Adrenaline, Nicotine) on frog's heart.

perfusion of isolated frogs heart with effects of Na^+ , K^+ and Ca^{++} ,

- and demonstration of Starling's law

Museum to be developed

Historical land marks, Nobel laureates

Approved in Bm 43/2015, Dated 06/11/2015
Resolution No. - 3.1

Resolution No. 3.1(a): Resolved to incorporate the videos of animal experiments in First MBBS Physiology Practical/Demonstrations of Experimental Physiology (Annexure-I) for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

Annexure - I

List of animated videos for Experimental (Amphibian) Physiology practicals:

- Instruments of experimental physiology
- Dissection to obtain Nerve muscle preparation
- Reactivity of Tissues + Simple Muscle Twitch + Effect of temperature on muscle contraction
- Effect of increasing strength of stimulus + Effect of two successive stimuli on muscle twitch
- Genesis of Tetanus + Genesis of Fatigue
- Effect of Load on Muscle Contraction + Isometric Contraction
- Conduction Velocity of Nerves
- Normal Cardiogram of Frog + Effect of Temperature on Frog's heart
- Effects of Stannius Ligatures on Frog's Heart
- Properties of the heart muscle
- Effect of Vagosympathetic Stimulation on Frog's heart
- Effect of Nicotine and atropine on Frog's heart
- Effect of Ion's on Perfused Frog's heart

Annexure -- II

Horizontal Integration: Is done in collaboration with physiology and biochemistry departments on clinically relevant topics during the course.

- Lung (bronchopulmonary segments)
- Heart (Conducting system)
- Liver (cirrhosis) and hepatic acini
- Peptic ulcer
- Coronary heart disease
- Parkinsonism
- Portal hypertension
- Diabetes mellitus
- Jaundice (hepatitis)
- Cerebral stroke
- Spinal cord
- Cerebellum
- Cerebrum
- CSF

1. Introduction of early clinical exposure

- For example –
 - Introduction to imaging techniques and correlation with anatomical structure in normal person.
 - Upper limb – Erb's palsy, Klumpke's paralysis, claw hand, wrist drop,
 - Lower limb – varicose veins, Trendelenburg's test for gluteus medius, Knee arthroscopy and replacement, foot drop
 - Thorax – pleural effusion, procedure of pleural or pericardial tap, diaphragmatic hernia, X-ray chest with introduction of terms such as CT scan, HRCT, Bronchoscopy. Introduction of echocardiography and valvular movements, Angiography.
 - Abdomen – renal calculi, Meckel's diverticulum, cholecystitis, Introduction to endoscopy of stomach and large intestine and duodenum, Pancreatic and gallstone removal with endoscopy.
 - Pelvis – interior of bladder by cystoscopy, ectopic pregnancy, haemorrhoids, Introduction of pelvic laparoscopy.
 - Head, face, neck – facial palsy, parotitis, black eye in scalp injury
 - Neuro-anatomy – Huntington's chorea, hydrocephaly, procedure of lumbar puncture, Introduction of MRI and MRI angiography and tensor imaging.

Embryology animations:

Various anomalies as per organ development.

Fertilization.

Implantation.

Folding of embryo.

Rotation of Gut.

Pharyngeal apparatus.

Face.

Developing heart.

ANNEXURE - II

Item No. 3: To consider and take appropriate resolutions on the recommendations and decisions taken by the Academic Council (AC-22/2015) in its meeting held on Saturday, 17th October, 2015.

Resolution No. 3: Following Resolutions were passed by the Board of Management on the recommendations of the meeting of Academic Council AC-22/2015 dated 17/10/2015 :

3.1 Preclinical :

✓ **Resolution No. 3.1(a):** Resolved to incorporate the videos of animal experiments in First MBBS Physiology Practical/Demonstrations of Experimental Physiology (Annexure-I) for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

✓ **Resolution No. 3.1(b):** Resolved to include Early Clinical Exposure in the curriculum of First MBBS by way of video clipping, animations, visit to Wards wherever necessary (Annexure-II) for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

Resolution No. 3.1(c): Resolved to shift 'Thorax' portion from Anatomy (1st MBBS) Paper II to Paper I to have proper distribution in two papers for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

✓ **Resolution No. 3.1(d):** Resolved to accept the proposed pattern of redistribution of the marks in First MBBS – University Biochemistry Practical Examination (Annexure-III) for the batch of Students to be admitted in 1st MBBS from the academic year 2016-17 onwards.

Resolution No. 3.1(e): Resolved to conduct a workshop on competency based education in both the Campuses at Navi Mumbai & Aurangabad for all courses under MGM Institute.

3.2 Paraclinical :

✓ **Resolution No. 3.2(a):** Resolved to approve the change in existing journal of 2nd MBBS Microbiology (Annexure-IV) & log book of MD Microbiology (Annexure-V) for the batch of Students entering into 2nd MBBS from the academic year 2016-17 onwards.

✓ **Resolution No. 3.2(b):** Resolved to approve the change in syllabus of Microbiology MBBS (Annexure-VI) for the batch of Students entering into 2nd MBBS from the academic year 2016-17 onwards.

✓ **Resolution No. 3.2(c):** Resolved to approve the change in syllabus of Pathology MBBS (Annexure-VII) and Pathology PG Logbook (Annexure-VIII) for the batch of Students entering into 2nd MBBS from the academic year 2016-17 onwards.

Department of Health Sciences
MGM Medical College, Kamothe, Navi Mumbai
5/12/14
REPA-2

DEPARTMENT OF PHYSIOLOGY
M. G. M. MEDICAL COLLEGE, KAMOTHE, NAVI MUMBAI
MGMMC/PHY/1413/2014

Date: 01.12.2014

To,
The Registrar,
MGMIHS,
Kamothe, Navi Mumbai

(Through Chairman BOS – Pre clinical)

Subject: First MBBS Physiology Model Question Paper – Paper I & II (Section B & Section C)


Sir,


With reference to discussion during video conferencing on the date 24.11.2014, please find herewith model question papers for First MBBS Physiology Paper I & II (Section B & Section C).

This is for your kind information and necessary action.

Thanking you,

Yours faithfully,


02-12-14.
Dr. P. J. Shinde
Professor & Head
Department of Physiology
MGM Medical College,
Aurangabad


Dr. R. S. Inamdar
Professor & Head
Department of Physiology
MGM Medical College,
Kamothe, Navi Mumbai

Dr. (Signature)



MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI

I-MBBS - MODEL QUESTION PAPER

Subject - PHYSIOLOGY PAPER-I

Maximum Marks: 50

Duration – 2 ½ Hours (Section A = 30 Minutes. Section B & C = 2 Hours)

SECTION – B

Write briefly on ANY FOUR

(5 marks X 4 = 20 marks)

- a. Primary active transport
- b. Erythroblastosis foetalis
- c. Baroreceptors
- d. Ovulation
- e. Hypoxic Hypoxia

SECTION – C

Answer in detail (ANY TWO OUT OF THREE)

(10 marks X 2 = 20 marks)

- a. Enumerate hormones secreted by anterior pituitary. Describe actions of growth hormone. Add a note on disorders due to hyper secretion of growth hormone. (2+5+3)
- b. What are the functions of platelets? Describe intrinsic pathway. Add a note on haemophilia (4+4+2)
- c. Describe the transport of oxygen in the body. Draw and label Oxy-haemoglobin dissociation curve. What are the factors affecting Oxy-haemoglobin dissociation curve. (4+3+3)

MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI

I-MBBS - MODEL QUESTION PAPER

Subject - PHYSIOLOGY PAPER-II

Maximum Marks: 50

Duration – 2 ½ Hours (Section A = 30 Minutes, Section B & C = 2 Hours)

SECTION – B

Write briefly on ANY FOUR

(5 marks X 4 = 20 marks)

- Peristalsis
- Organ of Corti
- Juxtaglomerular apparatus
- Classification of receptors
- Myasthenia gravis

SECTION – C

Answer in detail (ANY TWO OUT OF THREE)

(10 marks X 2 = 20 marks)

- Describe the composition, functions and regulation of secretion of gastric juice. Add a note on peptic ulcer. (2+2+3+3)
- Describe connections and functions of basal ganglia. Add a note on Parkinsonism. (4+4+2)
- Describe visual pathway with the help of a neat, labeled diagram. What are the effects of lesions at various levels of the visual pathway? (4+3+3)

MGM MC / PHY / 1310 / 2014

LIST OF PHYSIOLOGY BOOKS FOR I MBBS (UNDERGRADUATE COURSE)**B. Standard text books**

S.N.	Name of the book	Name of the Author
1.	Textbook of Physiology Volumes I & II	A. K. Jain
2.	Medical Physiology for undergraduates new 2012 / 13	Indu Khurana
3.	Textbook of Medical Physiology South Asian Edition 2013	Guyton & Hall
4.	Fundamentals of Medical Physiology	L. Prakasam Reddy

B. Concise books

S.N.	Name of the book	Name of the Author
1.	Concise physiology for undergraduates	A. K. Jain
2.	Essentials of Medical Physiology 6 th Edition 2012	Sembulingam
3.	Textbook of Physiology	Debasis Pramanik
4.	Physiology - Prep manual for undergraduates 4 th Edition 2009	V. D. Joshi

C. Reference books

S.N.	Name of the book	Name of the Author
1.	Textbook of Medical Physiology 2005	Indu Khurana
2.	Ganong's review of medical physiology	Barrett & Barman
3.	Understanding Medical Physiology: A textbook for medical students	R. L. Brijlani & Manjunatha
4.	Physiological basis of medical practice	Best & Taylor

D. Practical books

S.N.	Name of the book	Name of the Author
1.	Practical Physiology	A. K. Jain
2.	Practical Physiology	G. K. Pal
3.	Textbook of practical Physiology	V. D. Joshi
4.	Textbook of practical Physiology	C. L. Ghai

The above list of books is recommended by Board of studies for MGMIHS University

Dr. R. S. Namdar
Dr. Sangita Phatale
MGM Medical College,
Navi Mumbai & Aurangabad

To
Dr. Deepak A. D.
Chairman
Board of Studies
MGMIHS
Professor & Head
Department of Biochemistry;
M.G.M. Medical College,
Kamothe, Navi Mumbai.

Approved in BOM 38/2014, dated 28/11/2014, Resolution No. - 3.1

Approved As per Bom 45/2016, Dated 28/04/2016
Resolution No. - 3.1 (b)

Resolution No. 3.1(b): Resolved to accept revised method to calculate internal assessment marks for 1st MBBS as given below from the academic year 2016 -17 onwards:

For Theory:

	Anatomy	Physiology	Biochemistry
1 st Sem. & Prelim Exam.	15	15	15
Day to day assessment as per MCI norms	05	05	05
Total marks	20	20	20

For Practical:

	Anatomy	Physiology	Biochemistry
1 st Sem. & Prelim Exam.	15	15	15
Day to day assessment as per MCI norms	05	05	05
Total marks	20	20	20

DEPARTMENT OF PHYSIOLOGY
MGM MEDICAL COLLEGE, KAMOTHE, NAVI MUMBAI

MGM/MED-C/PHY/2016/626

Date: 28.12.2016

To
The Registrar
MGM IHS,
Navi Mumbai

Subject: First MBBS Syllabus for Human Physiology, Human Anatomy & Human Biochemistry subjects.

Sir,

Please find herewith the First MBBS Syllabus for Human Physiology, Human Anatomy & Human Biochemistry syllabus, as submitted by HODs after due discussion sent by email registrar@mgmuhs.com & dyr@mgmuhs.com.

This is for your kind information and necessary action.

Thanking you,

Yours sincerely,

Academic Connect
fil
28.12.16



Dr. R. S. Inamdar
Chairman
Pre Clinical BOS
Professor & Head
Department of Physiology
MGM Medical College,
Kamothe, Navi Mumbai

MGM Institute Of Health Sciences
REWARD NO. 10099
DATE: 28/12/16
REF: 22

MGMIHS

**SYLLABUS
FOR
FIRST MBBS - HUMAN PHYSIOLOGY**

MGM INSTITUTE OF HEALTH SCIENCES
BROAD CURRICULUM AS PER MCI GUIDELINES
MBBS – PHASE I-SUBJECT – HUMAN PHYSIOLOGY

(A) PHYSIOLOGY

i) GOAL

The broad goal of the teaching Physiology to undergraduate students of First MBBS, aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

ii) OBJECTIVES

a) KNOWLEDGE

At the end of the course the student will be able to:

- (1) Explain the normal functioning of all the organ systems and their interactions for well coordinated total body function.
- (2) Assess the relative contribution of each organ system to the maintenance of the milieu interior.
- (3) Elucidate the physiological aspects of normal growth and development.
- (4) Describe the physiological response and adaptations to environmental stresses.
- (5) List the physiological principles underlying pathogenesis and treatment of disease.

b) SKILLS

At the end of the course the student should be able to:

- (1) Conduct experiments designed for study of physiological phenomena.
- (2) Interpret experimental/investigative data.
- (3) Distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

c) INTEGRATION

At the end of the integrated teaching the student should acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

(B) BIOPHYSICS

- (a) GOAL & OBJECTIVES:** The broad goal of teaching Biophysics to undergraduate students is that they should understand basic physical principles involved in the functioning of body organs in normal and diseased conditions.

Total time for teaching Biophysics = 5 hours

Out of which: 1. Didactic lectures = 3 hours

2. Tutorial/group discussion = 1 hour

3. Practical = 1 hour

(b) Topic distribution

(1) Lectures:

- (i) Physical principles of transport across cell membranes and across capillary wall.
- (ii) Biopotentials.
- (iii) Physical principles governing flow of blood in heart and blood vessels.
- (iv) Physical principles governing flow of air in air passages.

2. Tutorial/group discussion: On the topic covered in didactic lectures.

3. Practicals:

Demonstration of:

- a) Biopotential on oscilloscope
- b) Electro Encephalogram (EEG)
- c) Electromyogram (EMG)
- d) Electrocardiogram (ECG)

HUMAN PHYSIOLOGY

I) GOAL

- a. The broad goal of the teaching Physiology to MBBS - undergraduate students aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease

II) EDUCATIONAL OBJECTIVES

- 1) At the end of the course, the students will be able to: describe the normal functions of all the organs systems, their regulatory mechanisms and interactions of the various systems for well-coordinated total body functions.
- 2) Understand the relative contribution of each organ system in the maintenance of the milieu interior (homeostasis).
- 3) Explain the physiological aspects of normal growth and development. Analyse the physiological responses and adaptation to environmental stresses.
- 4) Comprehend the physiological principals underlying pathogenesis and treatment of disease.
- 5) Correlate knowledge of physiology of human reproductive system in relation to National Family Welfare Program.

III) SKILL

At the end of the course the students shall be able to:

- 1) Conduct experiments designed for study of physiological phenomena.
- 2) Interpret experimental/investigative data.
- 3) Distinguish between normal & abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

IV) INTERGRATION

- a. At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

V) COURSE CONTENT: -

Total number of hours – 480 hours

A) GENERAL PHYSIOLOGY (5 Hours)

Must know -

- Introduction to physiology
- branches of physiology
- Functional organization of human body
- External and internal environment
- Homeostasis, Biofeedback mechanisms

B) HAEMATOLOGY (15 Hours)

Must know

- Composition of blood
- Functions of blood
- Plasma proteins: Types, concentrations, functions.
- Erythrocytes: Morphology, functions, normal count physiological variations in normal count and anemia, polycythemia.
- Haemopoiesis: general concepts.
- Erythropoiesis: stages, sites, regulation, reticulocyte & its clinical significance.
- Haemoglobin: Functions, normal values, physiological variations.
- Fate of erythrocytes, life span.
- Catabolism of Hb, bilirubin metabolism, jaundice.
- Physiological basis of anaemia, nutritional anaemia.
- Polycythemia: Primary & secondary.
- Leukocytes: differences between R.B.C. & W.B.C, types of W.B.C.s normal count & differential W.B.C. count, physiological variations, properties, functions
- Granulopoiesis- stages, regulation
- Lymphopoiesis
- Pathological variations in total & differential W.B.C count.
- Immunity: definition, concept of antigen & antibody, types of immunity-Innate & acquired and their mechanism, cell mediated & humeral immunity, B lymphocytes, T lymphocytes & their types.
- Primary and Secondary response, basis of vaccination.
- Blood groups: Landsteiner's law
- ABO System- type A and B antigen, ABO system & inheritance, relation to transfusion, cross matching major & minor.

- Rh System - inheritance, Rh incompatibility & blood transfusion, Erythroblastosis foetalis.
- Blood transfusion: indications, storage of blood & changes during storage, transfusion reactions.
- Monocytes - macrophage system: Classification, functions of spleen.
- Hemostasis: definition, basic mechanisms of Hemostasis,
- Platelets: structure, normal count & variations, functions, role in platelet plug formation, Hemostasis & clot retraction.
- Blood coagulation factors in plasma, basic mechanism of blood clotting, intrinsic & extrinsic pathway & difference between two pathways, role of calcium in coagulation, role of vitamin K, fate of clot.
- Anticoagulants - commonly used & their mechanism of actions, blood coagulation tests – bleeding time, clotting time.
- Haemophillia.
- Body fluid compartments: role of water in body & its distributions, different body fluid compartments & composition of their fluid.
- Blood volume: normal value, physiological & pathological variations, blood volume regulation in detail (To be taken at end of lectures on C.V.S, kidney and endocrines)

Desirable to know

- Physical properties of blood.
- Plasma proteins: Plasmapheresis, role of liver in plasma protein synthesis, relationship of diet & plasma protein synthesis.
- R.B.C.: Advantages of biconcave shape.
- Bone marrow structure and cellular elements.
- Common Haemoglobinopathies (Hbs, Hbc, thalassemia)
- Method of determination of life span of R.B.Cs.
- Types of jaundice.
- Polycythemia- effects on haemodynamics,
- Immunity: Antibody structure & types, antigen- antibody reactions.
- Blood group: M.N. system, other blood groups.
- Thrombocytosis, thrombocytopenic purpura.
- Anticoagulants: used in vitro & in vivo.
- Other blood coagulation tests.

- Classification of hemorrhagic diseases, D.I.C.
- Measurement: total body water, blood volume, plasma volume, I.C.F. volume.

Nice to know

- Blood component therapy.
- Effects of splenectomy.
- Plasmin system.

B) NERVE (5 Hours)

Must know:

- Distinctive histological features relevant to functions of nerve fibers.
- Classification of nerve fibers: based on structure, functions and only for sensory nerves.
- R.M.P. definition, production & maintenance, method of measurement, significance.
- Action potential: definition,
- Phases- depolarization, repolarization & ionic basis of depolarization & repolarization.
- Production & propagation of A.P.
- Properties of A.P. significance
- Properties of nerve fibers.
- Strength duration curve: Chronaxie and factors affecting it.
- Factors affecting conduction in a nerve.

Desirable to know:

- Experimental techniques to study the mechanisms of production of R.M.P. & A.P.: patch clamp, voltage clamp
- Methods of recording of A.P.

D) MUSCLES (7 Hours)

Must know

Classifications of muscles

Structure of skeletal muscle:

Electron microscopic structure, muscle proteins- contractile, regulatory, structural & enzymatic

Sarcoplasmic tubular system: concept of sarcoplasmic triads & their functions.

Neuromuscular transmission: physiological anatomy, events, N-M blocking & clinical significance, applied aspect-myasthenia gravis.

Excitation- contraction coupling

- Molecular basis of skeletal muscle contraction: sliding filament theory, power stroke-cross bridge cycle and role of calcium.

Energetics: fuel used by skeletal muscle at rest & in exercise, metabolic pathways involved to yield A.T.P.

Oxygen debt: definition, types (lactic, alactic), incurring of debt, repaying the debt, significance.

- Properties of skeletal muscle: excitability, refractory period (absolute, relative), conductivity contractility-types (isometric, isotonic), effects of summations (multiple motor unit summation, frequency summation & tetanizability), all or none law, extensibility & elasticity, fatigability.
- Factors affecting development of tension in the muscle.
 - a. Number of motor units contracting- type of muscle, number of muscle fibers in each unit activated, supraspinal influences.
 - b. Length –tension relationship
 - c. Frequency of stimuli, duration of stimulation
 - d. Load
 - e. Type of contraction
 - f. Chemical composition of muscle fibers and ions.
 - g. E.M.G.(in brief)
 - h. Skeletal muscle circulation.
 - i. Smooth muscle: structure, distribution, types, molecular mechanism of contraction, properties, regulation, and disorders.

Desirable to know

- Heat liberated during various phases of contraction, fenn effect.
- Recording of muscle activity.

Nice to know

- E.M.G. details.

E) RESPIRATORY PHYSIOLOGY (15 Hours)

Must know

- Physiological anatomy
- Functions of respiratory system, non respiratory functions of lung
- Mechanics of respiration:

Ventilation:

Inspiratory & expiratory muscles, intrapleural pressure, lung & thoracic compliance, factors affecting compliance, work of breathing, surface tension forces & role of surfactant, airway resistance and elastic resistance.

- Lung volumes and capacities. Measurement, physiological & significance (tidal volume, Inspiratory reserve volume, expiratory volume, vital capacity, forced vital capacity- details)
- Pulmonary ventilation, alveolar dead space, -applied aspect.
- Maximum breathing capacity & breathing reserve.
- Diffusion of Gases:
- Exchange of respiratory gases at alveolar- capillary membrane, factors affecting diffusion.
- Gas Transport:
- Transport of oxygen, role of Hemoglobin, oxygen dissociation curve & factors affecting it.
- Transport of carbon dioxide.
- Control of Breathing:
- Neural control – central & peripheral chemoreceptors, role of CO_2 , O_2 , H^+
- Pulmonary circulation
- Characteristics
- Ventilation perfusion ratio
- Respiratory adjustment in exercise
- Hypoxia: types & high altitude hypoxia
- Artificial respiration
- Pulmonary function tests
- Desirable to know
- Method of determination of dead space, residual volume, functional residual capacity.
- Oxygen therapy: indications, hazards of hyperbaric oxygen & use.

Nice to know

- Concept of P_{50}
- Positive pressure breathing.

- **F) CARDIOVASCULAR PHYSIOLOGY (20 hours)**
- **Must know**
- Introduction, functions & importance of the system.
- General organization.
- Structure of heart, pericardium, myocardium, endocardium, nerve supply.
- Histology, details of cell junctions, syncytium, contractile & conducting fibers.
- Properties of cardiac muscle: excitability, conductivity, contractility, autorhythmicity, all or none law, long refractory period.
- Junctional tissues of heart, pacemaker potential, action potential of cardiac muscle.
- Generation & conduction of cardiac impulse.
- Cardiac cycle: pressure - volume changes, heart sounds & their clinical significance, correlation of pressure, volume, ECG, heart sounds in cardiac cycle.
- Heart rate & its regulation.
- Haemodynamics – definition, blood flow, resistance
- Cardiac output: normal values, physiological variations, factors affecting cardiac output- details, regulation, measurement- principles.
- Blood pressure:
- Normal levels, measurement, determinants, short term & long term regulation- details.
- Capillary circulation, tissue fluid formation.
- Lymphatic system: Anatomy & structure formation of lymph, functions of lymphatic system, lymph flow & factors affecting it.
- Regional circulation: Physiologic anatomy, factors affecting, special features: coronary, cerebral, skin portal.
- Adaptation of cardiopulmonary system to various grades of exercise.
- Hemorrhagic shock- stages & compensatory mechanisms, effects on body, physiological basis of treatment in brief.
- **Desirable to know:**
- Ion channel & receptors (physiological, pharmacological & clinical significance)
- E.C.G. – electrical axis of heart, blocks, arrhythmias, ischaemia, infarctions.
- Heart sounds: murmurs & their clinical significance.
- **Nice to know**
- Experimental methods of studying cardiovascular physiology, Pathophysiology of oedema

G) RENAL PHYSIOLOGY (10 Hours)

Must know

- General introduction, structure & functions of kidney.
- Renal circulation: special features from functional point of view.
- Concept of clearance: to study renal physiology, for:
 - a) GFR- Inulin, creatinine, basic principle of radioisotope method.
 - b) Renal blood flow- PAH clearance.
 - c) Concentration & dilution of urine- free water.
- Formation of urine:
 - 1) Glomerular stage- GFR (definition, dynamics, factors affecting & measurement)
 - 2) Tubular stage- GFR reabsorption & secretion.
 - a) Sodium, potassium, glucose: details.
 - b) Handling of water- concentration & dilution of urine.
 - c) Secretion of H^+
 - 3) Role of kidney in acid-base balance.
- Physiology of micturition: Basic reflex & control, cystometrogram
- Artificial kidney: basic principles of dialysis.

Desirable to know:

- Experimental studies for renal functions.

Nice to know

Disorders of micturition

H) BODY TEMPERATURE REGULATION: (2 hours)

Must know:

- Homoeothermic - balance between heat gain & heat loss.
- Regulation of body temperature,
- Desirable to know:
- Hyperthermia, Hypothermia.

I) ALIMENTARY SYSTEM (12 hour)

Must know:

- General introduction & organizational plan, innervations and blood supply.
- Salivary secretion:

General principles & basic mechanisms of secretion composition, and functions of saliva, mechanisms & regulation of salivary secretion

Mastication and deglutition:

- Three phases of deglutition.
- Physiologic anatomy, mechanism & control, Gastric secretion:
- Gastric Motility:
- Structure, composition & mechanism of electrolytes & enzymes, regulation of secretion.
- Microscopic structure, functions of liver, composition of bile, cellular mechanism of bile formation, enterohepatic circulation of bile salts, control of secretion, concentration & storage of bile in gall bladder. Filling & evacuation of gall bladder, functions of gall bladder.

Intestinal secretion

- Structure, innervations.
- Composition & mechanism of secretion of small intestinal juice, regulation of secretion.
- Secretion of large intestine: mucous, water, electrolytes.
- Motility of small intestine:

Structure & innervation electrical activity of smooth muscle, resting membrane potential, slow waves, spike potentials, rhythmic segmentation contractions, peristalsis, control- neural & hormonal, functions of ileocecal valve.

Structure & innervation, mixing & mass movements, defecation reflex and its control

- G.I. hormones: in brief.

Digestion & absorption:

Digestion & absorption of

- carbohydrate,
- Proteins
- Fats

Absorption of water, electrolytes and vitamins

Desirable to know:

- Gastric mucosal barrier, experiment to study regulation of gastric juice secretion, disorders of secretion, peptic ulcer, inhibitors of gastric secretion.
- Effects of vagotomy, abnormal gastric motility, vomiting.
- Barium meal studies, endoscopy, biopsy.

- Pathophysiology of small intestinal motility, paralytic ileus, diarrhea, obstruction.
- Pathophysiology of colonic motility, irritable bowel syndrome, drugs, constipation.
- Pancreatic function tests.
- Gall stone, effects of removal of gall bladder.

Nice to know

- Disturbances of esophageal motility, spasm, achalasia, hiatus hernia.
- Methods for study of intestinal absorption.
- Effects of hepatectomy.

J) NUTRITION: (2 Hour)

Must know

- Concept of balanced diet
- Factors affecting caloric requirements.
- Requirements of various nutrients, sources, daily needs.
- Nutrition under special conditions- pregnancy, lactation, growing child.

K) ENDOCRINE SYSTEM (10 Hours)

Must know

- Introduction
- Endocrine functions of Hypothalamus- releasing hormones, Mechanism of hormone action.
- Anterior pituitary hormones;
Functions, regulation disorders
Thyroid: Hormone: synthesis, fate, functions, regulation parathormone secretion, functions and tetany.
Adrenal cortex: and medulla.
Hormone: secretion, functions, regulation, disorders.
- Pancreatic hormones.
Secretion, functions, regulation, disorders.

Desirable to know:

Radioimmuno assays.

Nice to know

- Experimental studies.

L) REPRODUCTIVE PHYSIOLOGY: (8 hours)

Must know

- Sex chromosomes , sex determination, sex differentiation
- Functional of anatomy of reproductive system.
- Puberty: changes in male & females and its control.
- Spermatogenesis: stages & regulation.
- Semen analysis.
- Testosterone: actions & regulation
- Male sexual act.
- Menstrual cycle & ovarian cycle:
Phases & hormonal regulation
- Menopause.
- Ovulation: indicators & importance.
- Fertilization, implantation of ovum.
- Functions of placenta.
- Physiology of pregnancy.
- Maternal changes during pregnancy.
- Parturition: in brief – stages and mechanism.
- Lactation: initiation & maintenance and control.
Advantage of breast -feeding.
- Contraception: to be taken as integrated topic.

Desirable to know:

- Sex chromosomes: Barr bodies.
- Development of genitals & gonads.

Nice to know:

- Precious & delayed puberty.

M) SPECIAL SENSES (8 Hours)

Must know:

- Eye:
Functions anatomy of eye, optics, microscopic structure of retina with retinal circuits,
image formation.
Photochemistry of vision, photopic & scotopic vision, dark & light adaptation

Pupillary reflexes, Accommodation reflex Errors of refraction and their correction, colour vision – physiological & neural basis, accepted theory of colour vision, classifications, basis of colour blindness and tests of colour blindness, significance. Visual pathway- processing of information at different levels in visual pathway, organization of visual cortex. Effects of lesion at different levels in visual pathway Movement of eyeballs: functions & control.

- Ear
- Physics of sound, decibel system,
- Functions of external ear,
- Functional anatomy of middle ear, functions of middle ear in detail, assessment of functions of middle ear, Functional anatomy of cochlea, functions of inner ear, place principle, theories of hearing.
- Audiometry,
- Auditory pathway & important features, auditory cortex (role in hearing speech development)
- Taste
- Functional anatomy of taste receptors, primary taste sensations, pathway, factors affecting taste sensation.
- Smell:
- Functional anatomy of olfactory receptors, primary olfactory sensations pathway, factors affecting smell sensation.
- **Desirable to know:**
- Resolution of images.
- Electrophysiology of internal ear: cochlear micro phonics.
- **Nice to know**
- Electrophysiology of retina.
- Theories of hearing.

N) CENTRAL NERVOUS SYSTEM: (50 hours)

Must know

- Outline of nervous system.
- 6) General nervous system:
 - Synapse: definition, physiological anatomy, sequence of synaptic transmission, applied aspect.
 - Neurotransmitters-in brief
 - Receptors: definition, classification (basis of each classification with example), properties (state each property with underlying mechanism and significance), significance (homeostasis, conscious awareness of environment, tone posture, protection).
 - Sensations: different modalities, classification with examples and significance
 - Sensation of touch, pain proprioception: details of each
 - Reflexes: definition, classification (basis of classification with example), reflex arc and its components, properties (state each property with basis and importance)
 - Stretch reflex – definition, muscle spindle, details with innervations, role of gamma motor neurons) role of supra spinal control – in brief, functions of stretch reflex (regulation of muscle tone) inverse stretch reflex.
 - Polysynaptic reflexes: withdrawal reflex.
- 2) Tracts:
 - Ascending and descending tracts: details of each tracts – (situation & extent in spinal cord, origin, course and termination, collaterals, somatotopic arrangement, functions, applied aspect, tests)
 - Ascending tracts: Basic plan of somatosensory pathway for conscious sensation, pathway from head, face region.
 - Descending tracts: pyramidal tracts-details. Extra pyramidal tracts, differences between UMN and LMN lesions.
- 2) Sections at various levels in CNS:
 - a) Spinal transection – spinal animal.
 - Complete – 3 stages – spinal shock, stage of recovery, stage of reflex failure – details of each stage.
 - Incomplete transection
 - Hemisectomy

b) Low midbrain section – decerebrate animal: Decerebrate rigidity. (Classical and ischaemic with mechanisms, characteristics features, physiological significance)

c) High midbrain section – High decerebrate animal.

d) Thalamic or Decorticate animal.

3) Posture - & Equilibrium.

Definition, classification of postural reflexes

(Details of each reflex and its function)

Regulation of posture (integrating centers at various levels of CNS)

Vestibular apparatus: Physiologic anatomy, mode of function of utricle and saccule and semicircular canals, vestibule ocular and vestibule spinal reflexes.

4) Thalamus:

Functional classification of Thalamic nuclei, with connections of different nuclear groups, functions

6) Limbic system:

Parts of limbic system, connections in brief, functions.

7) Reticular formation:

Introduction, anatomy in brief, functional divisions

(A) Ascending reticular activating system – details with connections and role in sleep wakeful cycle, applied aspect.

(B) Descending reticular system – role in regulation of muscle tone by pontine and medullary regions.

(C) Visceral centres.

8) E. E. G.:

Definition, different waves, characteristics and functional significance of each wave, physiological variation, clinical application in brief.

9) Sleep and Wakefulness:

Concept of alertness and wakefulness with their physiological basis. Definition of sleep, stages of sleep correlated with EEG, sleep cycle – types of sleep, salient features of NREM & REM sleep, physiological effects of sleep on different systems of the body, Neurophysiological mechanisms of sleep, functions of sleep.

10) Cerebellum:

Introduction, functional classification, intracortical circuit, deep cerebellar nuclei, connections of different lobes, functions of cerebellum, cerebellar function tests, effects of lesion in brief.

11) Basal Ganglia:

Introduction, classification of nuclei, connections, intracortical circuits, functions, lesions – Parkinsonism

12) Cerebral Cortex:

Gross anatomy and divisions, concept of Brodman's mapping with diagram, Parietal lobe – anatomical & functional divisions, details of each functional part as regards connections, topographic organisation, functions. Frontal lobe – excitomotor cortex - anatomical & functional parts, details of each part as regards connections, topographic organisation, functions.

Prefrontal Cortex – different areas, connections in brief, functions, effects of lobectomy.

13) Speech –

Afferent and efferent mechanisms and role of cortical centers in speech, concept of cerebral dominance, development of speech, vocalization.

14) Memory:

Definition, stages, types, physiological basis, factors affecting, applied – amnesias in brief.

15) Learning:

Definition, types with examples, stages, factors influencing, role of motivation (positive and negative reinforcement, reward and punishment), physiological basis – role of different parts of CNS, structural, biochemical changes.

16) Conditioned reflexes:

Definition, difference between unconditioned and conditioned reflexes, development of conditioned reflexes, properties, significance

17) Autonomic nervous system:

Organization and functions of Parasympathetic and Sympathetic nervous system and their control

18) CSF:

Introduction, composition, normal CSF pressure, formation and circulation, functions, applied aspect – brief, blood brain barrier, blood CSF barrier.

19) i. Physiology of Brain Death and changes after that

ii. Brain death and organ donation

Desirable to know:

General nervous system:

Neurotransmitters – details, susceptibility of synapse to hypoxia drugs etc.,

Mechanisms of referred pain, differences between superficial and deep pain, central analgesia system, supraspinal control of stretch reflex – details.

Thalamus – applied aspects – effects of lesions.

Hypothalamus – applied aspects – effects of lesions

Reticular formation – effects of lesion

EEG – Method of recording, abnormal patterns.

Basal Ganglia – lesions, involuntary movements

Cerebellum – Embryology, evolution, effects of stimulation and ablation.

Cerebral cortex- effects of stimulation and ablation in different regions.

Speech – aphasias.

Nice to Know

Experimental studies – effects of stimulation and ablation.

Sleep, wakefulness – effects of sleep deprivation, disorders.

PHYSIOLOGY PRACTICALS

NO.	TITLE OF PRACTICAL
PART – I : HAEMOTOLOGY (PRACTICALS)	
1.	The Microscope and Collection of Blood
2.	Estimation of Haemoglobin content of Blood
3.	W.B.C. Count
4.	R.B.C. Count
5.	Determination of Blood Groups
6.	Differential W.B.C. Count
7.	Determination of Bleeding Time & Coagulation Time
PART – II : HAEMOTOLOGY (DEMONSTRATIONS)	
1.	Platelets / Thrombocytes
2.	Reticulocyte Count
3.	Determination of Erythrocyte Sedimentation Rate & Estimation of Packed Cell Volume
4.	Anemia & Blood Indices
5.	Osmotic fragility of red blood cells
6.	Blood Transfusion – Visit to Blood Bank
PART – III : CLINICAL PHYSIOLOGY	
1	Introduction to Clinical Examination
2	Clinical Examination of Arterial Pulse and Estimation of Venous Pressure
3	Determination of Arterial Blood Pressure
4	Clinical Examination of Cardiovascular system
5	Clinical Examination of Respiratory system
6	Artificial Respiration in Man
7	Clinical Examination of the Alimentary system and the abdomen
8	Clinical Examination of Higher Functions
9	Clinical Examination of III, IV, VI Cranial Nerves
10	Clinical Examination of Other Cranial Nerves-I, V, VII, IX, X, XI, XII
11	Clinical Examination of Sensory System
12	Clinical Examination of Motor System-I
13	Clinical Examination of Motor System-II
14	Tests for Hearing & Deafness
15	Clinical Examination of Eyes
16	Visual Reflexes
17	Acuity of Vision
PART – IV : HUMAN PHYSIOLOGY (LECTURE-CUM-DEMONSTRATION)	
1	Cardiopulmonary Efficiency Tests
2	Electrocardiography (E.C.G.)
3	Spirometry
4	Stethography
5	Ergography
6	Perimetry
7	Colour Vision
8	Pregnancy Test
9	Body Temperature in Man

	PART - V : EXPERIMENTAL PHYSIOLOGY (LECTURE-CUM-DEMONSTRATION)
1	Study of instruments and Normal Cardiogram
2	Effect of Temperature on Frog's Heart
3	Properties of Cardiac Muscle-I
4	Properties of Cardiac Muscle-II
5	Properties of Cardiac Muscle-III
6	Beneficial Effect
7	Nervous Regulation of Heart
8	Vagal Escape
9	Effect of Acetylcholine of Frog's Heart
10	Effect of Adrenaline on Frog's Heart
11	Effect of Nicotine on Frog's Heart
12	Effect of various ions on isolated Frog's Heart
13	Simple Muscle Curve
14	Effect of Various Strengths of Stimuli
15	Effect of two success stimuli in skeletal muscle
16	Velocity of nerve impulse effect
17	Effect of Load
18	Genesis of Tetanus
19	Phenomenon of Fatigue
	PART – VI : PHOTOGRAPHS, GRAPHS & CHARTS
1.	Calculations - Blood
	- CVS
	- RS
	- Renal
2.	Graphs & Charts - Cystometrogram
	- Volume - Pressure Curve in different chambers of the
	Heart -
	- Strength Duration Curve
	- Action Potential in Nerve Fiber
	- Action Potential in Purkinje fiber of Heart
	- Compound Action Potential
	- Typical Photographs of endocrine disorders Gigantism
	- Dwarfism
	- Acrompgaly
	- Grave's Disease
	- Cretinism
	- Myxoedema
	- Cushing's Syndrome
	- Carpopedal Spasm

List of animated videos for Experimental (Amphibian) Physiology practicals:

- Instruments of experimental physiology
- Dissection to obtain Nerve muscle preparation
- Reactivity of Tissues + Simple Twitch + Effect of two successive stimuli on muscle twitch
- Genesis of Tetanus + Genesis of Fatigue
- Effect of Load on Muscle Contraction + Isometric Contraction
- Conduction Velocity of Nerves
- Normal Cardiogram of Frog + Effect of Temperature on Frog's heart
- Effects of Stannius ligatures on Frog's Heart
- Properties of Vagosympathetic Stimulation on Frog's heart
- Effect of Nicotine and atropine of Frog's heart
- Effect of Ion's on Perfused Frog's heart

Introduction of early clinical exposure

- 1) Visit to – Hospital, OPD, Blood Bank, Central Clinical Laboratory, Pulmonary function test Laboratory, Cardiology (Stress Test, Echo-cardiography), Neurology (EEG, EMG), Audiometry, Ophthalmology.
- 2) Inclusion of videos, X-rays, ECGs, Lab. Reports, case profile, patients.

LIST OF PHYSIOLOGY BOOKS FOR FIRST MBBS
(UNDERGRADUATE COURSE)

A. Text books

S.N.	Name of the book	Name of the Author
1.	Textbook of Physiology Volumes I & II	A. K. Jain
2.	Medical Physiology for undergraduates	Indu Khurana
3.	Textbook of Medical Physiology	Guyton & Hall
4.	Comprehensive Textbook of Medical Physiology Vol I & Vol II	G. K. Pal
5.	Fundamentals of Medical Physiology	L Prakasham Reddy

B. Concise books

S.N.	Name of the book	Name of the Author
1.	Concise physiology for undergraduates	A. K. Jain
2.	Essentials of Medical Physiology	Sembulingam
3.	Textbook of Physiology	Debasis Pramanik
4.	Physiology – Prep manual for undergraduates	V. D. Joshi

C. Reference books

S.N.	Name of the book	Name of the Author
1.	Textbook of Physiology	Indu Khurana
2.	Ganong's review of medical physiology	Barrett & Barman
3.	Understanding Medical Physiology: A textbook for medical students	R. L. Bijlani & Manjunatha
4.	Physiology basis of medical practice	Best & Taylor

D. Practical books

S.N.	Name of the book	Name of the Author
1.	Practical Physiology	A. K. Jain
2.	Practical Physiology	G. K. Pal
3.	Textbook of practical Physiology	V. D. Joshi
4.	Textbook of Practical Physiology	C. L. Ghai

RULES AND REGULATIONS OF EXAMINATION

4. THEORY EXAMINATION IN PHYSIOLOGY

4.1. There shall be two papers in preliminary / university examination in the physiology.

The course content shall be distributed as per given below:

4.2. **Physiology Paper-I:** Cell membrane and transport systems across the cell membrane, Homeostasis, Cardiovascular, Blood, Respiratory, Endocrines, Reproduction, Acclimatization to hypoxia, Exercise physiology.

4.3. **Physiology Paper II:** Nerve and Muscle Physiology, Gastrointestinal, Excretory and Temperature regulation, C.N.S. and special senses.

• PATTERN OF VIVA VOCE AND PRACTICAL EXAMINATION:

There shall be separate batches of students for viva and Practicals.

• Viva examination (orals)	Total marks 20
----------------------------	----------------

• Practical examination	Total marks 40
-------------------------	----------------

3 Exercises

• Clinical examination	Total marks 20
------------------------	----------------

Four sub questions each of 5 marks

• C.V.S.	Total marks 5
----------	---------------

• R.S.	Total marks 5
--------	---------------

• C.N.S.	Total marks 5
----------	---------------

• Abdomen & Special senses	Total marks 5
----------------------------	---------------

• Haematology	Total marks 10
---------------	----------------

• Short exercises	Total marks 10
-------------------	----------------

Sub questions having 2 marks each

• Calculations

• Interpretation of graphs

• Charts

• Data analysis and interpretation

• Photographs on-endocrine disorders

• Neurological disorder

- **TOPICS TO BE ASKED AS APPLIED QUESTIONS IN THEORY:**

- Erythroblastosis foetalis
- Haemophilia, purpura
- Myasthenia gravis
- Peptic ulcer
- Oedema
- Jaundice and anaemia – due to mismatched transfusion
- Myxoedema
- Cretinism
- Hyperthyroidism
- Tetany
- Acromegaly, Gigantism
- Respiratory distress syndrome
- Parkinsonism
- Asthma

- 7.1. Internal assessment shall be based on the overall performance of the students during examinations during the course of the study in First MBBS
- 7.2. Weightage for the internal assessment shall be 20% of the total marks in each subject
- 7.3. The students must secure a minimum of 35% of the total marks assigned for internal assessment in the subject in order to be eligible to appear in final university examination in that subject
- 7.4. There shall be one terminal examination on conclusion of First semester and one preliminary examination 6 weeks prior to commencement of university examination
- 7.5. The First terminal examination will include one theory paper of 60 marks and practical of 40 marks and viva 20 marks. Preliminary examination shall have Theory 100 marks (2 papers of 50 marks each), viva 20 marks and practicals of 40 marks
- 7.6. Computation of Internal Assessment – Internal assessment shall be computed out of 40 marks (20marks in theory and 20 marks in practical) on overall performance in class test / internal examination conducted by the department, seminars, presentation, project work, field work, laboratory journal and attendance etc.

Internal Assessment of Physiology

INTERNAL ASSESSMENT:

	Theory	Practical
Terminal & Prelim exams	15	15
Day to day assessment	05	05
Total	20	20

EXAMINATION PATTERN

Terminal, Preliminary, University Examination

THEORY

	Terminal	Preliminary		University	
Total Marks	60	50	50	50	50
Durations	2.30 hrs.	2.30 hrs.	2.30 hrs.	2.30 hrs.	2.30 hrs.
Paper	Only one paper	Paper I	Paper II	Paper I	Paper II
Section A	MCQ – Sec-A 20 X 0.5 = 10 Marks	MCQ - Sec-A 20 X 0.5 = 10 Marks	MCQ - Sec-A 20 X 0.5 = 10 Marks	MCQ - Sec-A 20 X 0.5 = 10 Marks	MCQ - Sec-A 20 X 0.5 = 10 Marks
Section B	SAQ - Sec-B 6 out of 7 6 X 5 = 30 Marks	SAQ - Sec-B 4 out of 5 4 X 5 = 20 Marks	SAQ - Sec-B 4 out of 5 4 X 5 = 20 Marks	SAQ - Sec-B 4 out of 5 4 X 5 = 20 Marks	SAQ - Sec-B 4 out of 5 4 X 5 = 20 Marks
Section C	LAQ – Sec-C 2 out of 3 10 X 2 = 20 Marks	LAQ – Sec-C 2 out of 3 10 X 2 = 20 Marks	LAQ – Sec-C 2 out of 3 10 X 2 = 20 Marks	LAQ – Sec-C 2 out of 3 10 X 2 = 20 Marks	LAQ – Sec-C 2 out of 3 10 X 2 = 20 Marks

Practical Examination - Total Marks=40 Marks

Haematology - 10 Marks

Clinical - 20 Marks

Graphs, charts, endocrine photographs, calculations = 10 Marks

MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI**I-MBBS – MODEL QUESTION PAPER**

Subject – PHYSIOLOGY PAPER-I

Maximum Marks: 50

Duration – 2½ Hours (Section A=30 Minutes, Section B & C=2 Hours)

SECTION A**Multiple Choice Questions (MCQs)****(0.5X20=10marks)**

1. Which among the following is an example of a positive feedback mechanism? a. Clotting b. Regulation of blood glucose concentration c. Regulation of Blood pressure d. Thermoregulation	2. Transport of Glucose & sodium is an example of a. Antiport b. Symport c. Diffusion d. Osmosis
3. The second messenger system are the following EXCEPT a. cAMP b. cGMP c. Calmodulin d. GABA	4. Parasitic infestations produce increase in a. Neutrophils b. Eosinophils c. Lymphocytes d. Basophils
5. Immunoglobulin secreted in saliva, tears and milk is a. IgG b. IgA c. IgM d. IgE	6. Increase in RBC count is called a. Anemia b. Leukocytosis c. Polycythemia d. Leukemia
7. Plasma proteins exerts a colloidal osmotic pressure of 25-30mmHg which mainly due to a. Albumin b. Fibrinogen c. Prothrombin d. Globulin	8. Ramp signal for inspiration is produced in the a. Ventral respiratory group of neurons (VRG) b. Dorsal respiratory group of neurons (DRG) c. Apneustic center d. Pneumotaxic center
9. Normal value of anatomical dead space is a. 50ml b. 100ml c. 150ml d. 200ml	10. Bluish discoloration of skin and mucus membrane is termed a. Cyanosis b. Anemia c. Asphyxia d. Dyspnoea
11. T wave of ECG indicates a. Atrial depolarization b. Atrial repolarization c. Ventricular depolarization d. Ventricular repolarization	12. The energy of muscle contraction is derived from the following except: a. ATP b. Muscle glycogen c. Lactic acid d. Creatine phosphate
13. _____ are called exchange vessels a. Arteriole b. Veins c. Capillaries d. Arteries	14. Which of the following factor causes bradycardia? a. Exercise b. Excitement c. Fever d. Hypothermia
15. Second heart sound is produced due to closure of a. Semilunar valves b. Mitral valves c. Tricuspid valve d. Atrioventricular valves	16. The condition of circulatory failure is termed a. Shock b. Bradycardia c. Tachycardia d. Coma
17. Cushing syndrome is due to an increase in a. Glucocorticoids b. Mineralocorticoids c. Sex steroids d. Thyroxine	18. Diabetes insipidus occurs due to the deficiency of a. Growth hormone b. Insulin c. ADH d. Thyroxine
19. Normal serum calcium levels is -- mg/dl a. 5-6 b. 9-11 c. 12-16 d. 16-20	20. Fertilization occurs in the a. Fallopian tube b. Uterine cavity c. Cervix d. Vagina

SECTION – B

Write briefly on ANY FOUR

(5 marks X 4 = 20 marks)

- a. Primary active transport
- b. Erythroblastosis fetalis
- c. Baroreceptors
- d. Ovulation
- e. Hypoxic Hypoxia

SECTION – C

Answer in detail (ANY TWO OUT OF THREE) (10 marks X 2 = 20 marks)

1. Enumerate hormones secreted by anterior pituitary. Describe actions of growth hormone.
Add a note on disorders due to hyper secretion of growth hormone. (2+5+3)
2. What are the functions of platelets? Describe intrinsic pathway. Add a note on haemophilia (4+4+2)
3. Describe the transport of oxygen in the body. Draw and label Oxy-haemoglobin dissociation curve. What are the factors affecting Oxy-haemoglobin dissociation curve. (4+3+3)

MGM INSTITUTE OF HEALTH SCIENCES, NAVI MUMBAI

I-MBBS – MODEL QUESTION PAPER

Subject – PHYSIOLOGY PAPER-II

Maximum Marks: 50

Duration – 2½ Hours (Section A=30 Minutes, Section B & C = 2 Hours)

SECTION A

Multiple Choice Questions (MCQs)

(0.5X20=10 Marks)

1. The nerve fiber with maximum diameter is Group _____ fiber a. Aα b. Aβ c. B d. C	2. Troponin sub unit with affinity for calcium is a. T b. I c. C d. All of the above
3. Skeletal muscle contraction is excited when the intracellular concentration of _____ ion rises a. Na ⁺ b. K ⁺ c. Mg ²⁺ d. Ca ²⁺	4. Which salivary component minimizes risk of buccal infection and dental caries a. Lysozymes b. IgA c. Lactoferrin d. All of the above
5. Hydrochloric acid in the stomach is secreted by the a. Chief cells b. Parietal cells c. Mucous cells d. G cells	6. The following stimulates gastric juice secretion a. Gastrin b. Gastric distension c. Vagus nerve d. All of the above
7. The hormone causing gallbladder emptying is a. Gastrin b. Glucagon c. Cholecystokinin d. Secretin	8. The usual stimulus of peristalsis is a. Distension b. Sympathetic stimulation c. Acid chyme d. Alkaline chyme
9. Deglutition or Swallowing center is situated in a. Midbrain b. Pons c. Medulla d. Cerebellum	10. The percentage of glomerular filtrate normally reabsorbed is a. 1% b. 10% c. 15% d. 99%
11. Net filtration pressure in the kidney is ----mm Hg a. 5 b. 10 c. 15 d. 20	12. Glucose and-----are 100% reabsorbed by proximal convoluted tubule a. Na ⁺ b. water c. Cl ⁻ d. Amino acids
13. Major portion (more than 70%) of glomerular filtrate is reabsorbed in a. Loop of Henle b. Proximal convoluted tubule c. Distal convoluted tubule d. Collecting tubules	14. Amount of urine left in the urinary bladder at the end of micturition is-----ml. a. 50 b. 100 c. 150 d. Zero
15. Most synapses in the nervous system are a. Chemical b) Electrical c. Mechanical d) Conjoint	16. Head ganglion of autonomic nervous system is a. Thalamus b. Hypothalamus c. Superior cervical thalamus ganglion d. Stellate ganglion
17. The first relay station of pain is a. Spinal cord b Medulla c. Pons c. Thalamus	18. Most common site of lesion in the pyramidal tract is a. Internal capsule b. Midbrain c. Pons d. Medulla
19. Receptors for vision are a) Teloreceptors b) Exteroreceptor c) Interoreceptor d) Chemoreceptor	20. Which of the following essential for normal motor activity a) Motor cortex b) Cerebellum c) Basal ganglia d) All of the above

SECTION – B

Write briefly on ANY FOUR

(5 marks X 4 = 20 marks)

- a. Peristalsis
- b. Organ of Corti
- c. Juxtaglomerular apparatus
- d. Classification of receptors
- e. Myasthenia gravis

SECTION – C

Answer in detail (ANY TWO OUT OF THREE) (10 marks X 2 = 20 marks)

1. Describe the composition, functions and regulation of secretion of gastric juice. Add a note on peptic ulcer (2+2+3+3)
2. Describe connections and functions of basal ganglia. Add a note on Parkinsonism. (4+4+2)
3. Describe visual pathway with the help of a neat, labeled diagram. What are the effects of lesions at various levels of the visual pathway? (4+3+3)

Resolution passed in BOM – 48/2017, dated 24/01/2017

Item No. 5.6: BOS (Preclinical) dated 20.09.2016

- a) About **Internal assessment examination pattern Anatomy, Physiology and Biochemistry.**

Resolution No. 5.6(a): It was resolved to abide by the existing **Internal assessment examination pattern of Anatomy, Physiology and Biochemistry in 1st MBBS** with regards to distribution of marks and pattern in concurrence with rules of MCI & MGMIHS.

- b) **Internal Assessment pattern – First MBBS**

Resolution No. 5.6(b): It was resolved that the actual modality to calculate day to day assessment component of internal assessment in MBBS subjects is to be decided by the respective department heads with keeping all the records for verification in future.

F \$ERXW LQFOXVLRQ RI %LRHWKLFV LQ 0%%6 8* FXUULFX
G \$ERXW LQFOXVLRQ RI %LRHWKLFV LQ 3* FXUULFXOXP DQ
)RU ERWK DERYH LWHPV¶ IROORZLQJ UHVROXWLRQ ZDV DG
5HVROXWLRQ 1R F ,W ZDV UHVROYHG WR VHQG WKH P
FKDLU %LRHWKLFV WR 'HDQ)DFXOW\ \$XUDQJDEDG DQG 1D
&KDLUSHUVRQV RI %26 IRU WKHLU SHUXVDO DQG DSSURSUI
QH[W %26 PHHWLQJ IRU GLVFXVVLRQ >\$QQH[XUH ,, ,,, RI

Resolution No. 1.3.7.1 of BOM-51/2017: Resolved to continue the current Internal Assessment pattern for MBBS (i.e. 5 marks for Day-to-day assessment) for Pre and Para Clinical subjects (Anatomy, Physiology, Biochemistry, Microbiology, Pharmacology, Pathology and FMT). For rest of the subjects, Internal Assessment is to be calculated from terminal/Post end exam marks and Prelims examination, with immediate effect.

Resolution No. 1.3.7.3 of BOM-51/2017: Approved to include Bioethics in First MBBS curriculum with three Lectures (1 hr each) per subject of Anatomy, Physiology and Biochemistry with topics: (with effective from Academic year 2017-18)

2) Physiology –

- 1) Animal Ethics
- 2) Research Ethics
- 3) Patient's privacy & confidentiality

Resolution No. 1.3.7.2 of BOM-51/2017: Resolved to shift topic 'General Physiology' from Paper-I to Paper-II in the First MBBS-University examination from Academic year 2017-18.

Resolution No. 3.5.2 of BOM-52/2018: It was resolved to conduct Bioethics as lecture schedule in MBBS in Anatomy, Physiology, Biochemistry with topics & time table as mentioned below, with effect from batch admitted in 2017-18 onwards—

- 2) Physiology –
- 1) Animal Ethics (December)
 - 2) Research Ethics (January)
 - 3) Patient's privacy & confidentiality (February)

Resolution No. 4.5.1.3 of BOM-55/2018: Resolved to accept specific mark distribution in MCQ (Section A) in 1st MBBS – Anatomy, Physiology & Biochemistry. To be implemented from 2018-19 onwards. [Annexure-30-A,B,C]

Annexure C – 1**SPECIFIC MARK DISTRIBUTION IN MCQ PAPER IN I MBBS ANATOMY****Paper I**

Sr. No.	Topic	No. of Questions
1.	Upper Limb	4
2.	Thorax	4
3.	Systemic Histology	2
4.	Systemic Embryology	2
5.	Head, Face & Neck	4
6.	Neuroanatomy	4
Total		20

Paper II

Sr. No.	Topic	No. of Questions
1.	Lower Limb	4
2.	Abdomen	4
3.	Pelvis	4
4.	Systemic Histology	2
5.	Systemic Embryology	1
6.	General Histology	1
7.	General Embryology	2
8.	General Anatomy	1
9.	Genetics	1
Total		20

10 % of MCQ marks should be from clinically based questions

Annexure C - 2**SPECIFIC MARK DISTRIBUTION IN MCQ PAPER IN I MBBS PHYSIOLOGY****Paper I**

Sr. No.	Topic	No. of Questions
7.	General physiology	2
8.	Cardiovascular System	4
9.	Respiratory System	4
10.	Blood	4
11.	Endocrine	4
12.	Reproduction	2
Total		20

Paper II

Sr. No.	Topic	No. of Questions
10.	Nerve-Muscle Physiology	3
11.	Digestive System	4
12.	Renal System	4
13.	CNS	6
14.	Special Sense	3
Total		20

10 % of MCQ marks should be from clinically based questions

Sr. No.	Topic	MCQs (20)	Marks (10)
1	Molecular and functional organization of a cell and its sub-cellular components	01	0.5
2	Chemistry of enzymes and their clinical applications.	03	1.5
3	Chemistry and metabolism of proteins and related disorders.	02	01
4	Chemistry and metabolism of purines and pyrimidines and related disorders.	02	01
5	Chemistry and functions of DNA and RNA , Genetic code ; Protein biosynthesis & regulation (Lac-operon)	03	1.5
6	The principles of genetic engineering and their applications in medicine.	02	01
7	Chemistry and Metabolism of hemoglobin.	02	01
8	Biological oxidation.	01	0.5
9	Molecular concept of body defense and their applications in medicine.	01	0.5
10	Vitamins	02	01
11	Nutrition	01	0.5

Paper-II

Sr. No.	Topic	MCQs	Marks
1	Chemistry and metabolism of carbohydrates and related disorders.	02	01
2	Chemistry and metabolism of lipids and related disorders.	02	01
3	Mineral metabolism	02	01
4	Water and electrolyte balance & imbalance.	01	0.5
5	Acid base balance and imbalance.	01	0.5
6	Integration of various aspects of metabolism and their regulatory pathways.	01	0.5
7	Starvation metabolism	01	0.5
8	Mechanism of hormone action.	01	0.5
9	Environmental biochemistry.	01	0.5
10	Liver function tests, Kidney function tests, Thyroid function tests.	03	1.5
11	Detoxification mechanisms.	01	0.5
12	Biochemical basis of cancer and carcinogenesis.	01	0.5
13	Radioisotopes.	01	0.5
14	Investigation techniques : (LCD-Topics) First Aid in Biochemistry laboratory, Colorimeter, Electrophoresis, pH meter, Chromatography, Flame photometer, Lipid profile, Immunoassay techniques	02	01

I/C Head

Dept. of Biochemistry

Professor & Head

Department of Biochemistry,

MGM Medical College,

Kamothe, Navi Mumbai

BGS Member

Resolution No. 4.5.1.2 of BOM-55/2018: Resolved that the internal assessment for 1st M.B.B.S. will be calculated as per the table below from 2018-19 onwards. Further Departments should maintain record of Internal Assessment:

Theory: (20 Marks)

	I Terminal & Prelim	4 Periodicals	PBL	Seminar
Existing	15	3		2
Revised	10	5	5 PBL/Seminar/case studies/any other as per dept.	

Practical: 20 marks

	I Terminal & Prelim	4 Periodicals	OSPE	Journal
Existing	15	3		2
Revised	10	5	5 Journal/OSPE/any other method as per dept.	

Resolution No. 4.5.1.5 of BOM-55/2018: Resolved that : [Annexure-32]

- (i) It was resolved that haematology Practical evaluation in Physiology (Ist MBBS) should have a case – based question. (To be started from 2018-19 batch onwards.)

Existing	Revised
Hematology practical / 10 Marks	Hematology Practical along with case based question / 10 Marks

- (ii) It was resolved that experimental Practical evaluation in Physiology (Ist MBBS) should be in the form of spots so that all the students will be assessed for the same question. (To be started from 2018-19 batch onwards.)

Existing	Revised
Experimental – Skeletal Muscle, Cardiac Muscle, Graph, Charts, Endocrine Photographs, Calculation – asked as 5 items X 2 Marks = 10 Marks to be written & Viva taken by Examiner	Experimental – Skeletal Muscle, Cardiac Muscle, Graph, Charts, Endocrine Photographs, Calculation – To be Evaluated as Spots: 5 Spots X 2 Marks = 10Marks, each spot having 4 sub questions – a,b,c,d of 0.5 Marks each, given 5minutes each for objectivity & uniformity.

PHYSIOLOGY PRACTICAL EVALUATION SYSTEM

Haematology Practicals (Marks 10)

Sr. No.	Haematology Practical	Case Based Questions (e.g.)
1	Determination of Haemoglobin	Anaemia
2	Total WBC Count	Infection, Leukaemia
3	Total RBC Count	Polycythaemia, Aplastic anaemia
4	Differential WBC Count	Eosinophilia, Acute bacterial infection
5	Blood groups	Mismatched blood transfusion, Haemophilia
6	Bleeding time and Clotting time	Purpura, Haemophilia

(Each practical will be accompanied by one relevant case based question)

Spots (Graphs / Charts / Calculations)**Marks = 10**

Sr. No.	Item	No.	Marks
1.	Skeletal Muscle Graphs	1	2
2.	Cardiac Muscle Graphs	1	2
3.	Endocrine Photographs	1	2
4.	Charts	1	2
5.	Calculations	1	2

(Spots – 5 minutes for each spot. Total 5 spots X 2 Marks = 10 Marks)