



# MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

**Grade 'A' Accredited by NAAC**

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COMPETENCY BASED MEDICAL EDUCATION

(CBME)

(with effect from 2019-2020 Batches)

**Curriculum for**

**First M.B.B.S**

**Human Physiology**

Amended upto BOM 63/2021, Dated 17/02/2021

## **Amended History**

1. Approved as per BOM 57/2019 [Resolution no. 3.1.1.13], Dated 26/4/2019.
2. Amended upto BOM 63/2021 [Resolution No. 4.1.1.2.ii, Resolution No. 4.4.1.6]  
Dated 17/02/2021.

## Annexure – C – II

MGM Institute of Health Sciences, Navi Mumbai

**CBME-First M.B.B.S. (2019-20 batch)**

### **PHYSIOLOGY COURSE CONTENT**

(Based on Medical Council of India, Competency based Undergraduate curriculum for the Indian Medical Graduate, 2018. Vol. 1; page no.91-118)

#### **Total Teaching (hours) - 495**

- Lectures(hours)-160
- Small group teachings/tutorials/Integrated teaching/Practicals (hours)-310
- Self directed learning ( hours)-25
- Early clinical exposure(hours)- 30

#### **1 General Physiology (8 hours)**

Competency No.	Topics & subtopics
PY. 1.1	Structure and Functions of a Mammalian Cell
PY. 1.2	Principles of Homeostasis
PY. 1.3	Intercellular communication
PY. 1.4	Apoptosis – Programmed cell death
PY. 1.5	Transport mechanisms across cell membranes
PY. 1.6	Fluid compartment of the body, its ionic composition & measurements
PY. 1.7	Concept of pH & Buffer systems in the body
PY. 1.8	Molecular basis of resting membrane potential and action potential in excitable tissue
PY. 1.9	Methods used to demonstrate the functions of the cells and its products, its communication and their applications in Clinical care and research.

#### **2 Haematology ( 15 hours )**

Competency No.	Topics & subtopics
PY. 2.2	Origin, forms, variations and functions of plasma proteins
PY. 2.3	Synthesis and functions of Hemoglobin & explain its breakdown. Describe variants of hemoglobin
PY. 2.4	RBC formation (erythropoiesis & its regulation) and its functions
PY. 2.5	Types of anaemias & Jaundice
PY. 2.6	WBC formation (granulopoiesis) & its regulation
PY. 2.7	Formation of platelets, functions & variations
PY. 2.8	Physiological basis of hemostasis and anticoagulants. Describe bleeding & clotting disorders (Hemophilia, purpura)
PY. 2.9	Different blood groups and clinical importance of blood grouping, blood banking and transfusion
PY.2.10	Types of immunity , development of immunity and its regulation,* Covid-19 related – role of nutrition, immunity boosters, cytokine storm

**3 Nerve and Muscle Physiology ( 11 hours )**

Competency No.	Topics & subtopics
PY. 3.1	Structure and functions of a neuron and neuroglia; Nerve Growth Factor & other growth factors/cytokines
PY. 3.2	Types, functions & properties of nerve fibers
PY. 3.3	Degeneration and regeneration in Peripheral nerves
PY. 3.4	Structure neuro-muscular junction and transmission of impulses
PY. 3.5	Action of neuro-muscular blocking agents
PY. 3.6	Pathophysiology of Myasthenia gravis
PY. 3.7	Types of muscle fibres and their structure
PY. 3.8	Action potential and its properties in different muscle types (skeletal & smooth)
PY. 3.9	Molecular basis of muscle contraction in skeletal and in smooth muscles
PY. 3.10	Mode of muscle contraction (isometric and isotonic)
PY. 3.11	Energy source and muscle metabolism
PY. 3.12	Gradation of muscular activity
PY. 3.13	Muscular dystrophy: myopathies

**4 Gastro-intestinal Physiology ( 13 hours )**

Competency No.	Topics & subtopics
PY. 4.2	Composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal, juices and bile secretion
PY. 4.3	GIT movements, regulation and functions, defecation reflex. Role of dietary fibre.
PY. 4.4	Physiology of digestion and absorption of nutrients
PY. 4.5	Source of GIT hormones, their regulation and functions
PY. 4.6	Gut-Brain Axis
PY. 4.7	Structure and functions of liver and gall bladder
PY. 4.8	Gastric function tests, pancreatic exocrine function test & liver function tests
PY. 4.9	Physiology aspects of: peptic ulcer, gastro-oesophageal reflux disease, vomiting, diarrhea, constipation, Adynamic ileus, Hirschsprung's disease

**5 Cardiovascular Physiology (CVS) ( 21 hours )**

Competency No.	Topics & subtopics
PY. 5.2	Properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions
PY. 5.3	Events occurring during the cardiac cycle
PY. 5.4	Generation, conduction of cardiac impulse

PY. 5.5	Physiology of electrocardiogram (E.C.G.), its applications and the cardiac axis
PY. 5.6	Abnormal ECG, arrhythmias, heart block and myocardial infarction.
PY. 5.7	Haemodynamics of circulatory system
PY. 5.8	Local and systemic cardiovascular regulatory mechanisms
PY. 5.9	Factors affecting heart rate, regulation of cardiac output & blood pressure
PY. 5.10	Regional circulation including microcirculation, lymphatic, coronary, cerebral, capillary, Skin, foetal, pulmonary and splanchnic circulation
PY. 5.11	Patho-physiology of shock, syncope and heart failure

## 6 Respiratory Physiology ( 15 hours )

Competency No.	Topics & subtopics
PY. 6.1	Functional anatomy of respiratory tract
PY. 6.2	Mechanics of normal respiration, pressure changes during ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation, V/P ratio, diffusion capacity of lungs
PY. 6.3	Transport of respiratory gases: Oxygen and Carbon dioxide
	Regulation of respiration -- Neural & chemical
PY. 6.4	Physiology of high altitude deep sea diving
PY. 6.5	Principles of artificial respiration oxygen therapy, *ventilators, acclimatization and decompression sickness
PY. 6.6	Pathophysiology of dyspnea, hypoxia, cyanosis asphyxia; drowning, periodic breathing
PY. 6.7	Lung function tests & their clinical significance, *pulse oximetry

## 7 Renal Physiology ( 8 hours )

Competency No.	Topics & subtopics
PY. 7.1	Structure and function of kidney
PY. 7.2	Structure and functions of juxta glomerular apparatus and role of renin-angiotensin system
PY. 7.3	Mechanism of urine formation and processes involved
PY. 7.4	Significance & implication of Renal clearance
PY. 7.5	Renal regulation of fluid and electrolytes & acid-base balance
PY. 7.6	Innervations of urinary bladder, physiology of micturition and its abnormalities
PY. 7.7	Artificial kidney, dialysis and renal transplantation
PY. 7.8	Renal Function Tests
PY. 7.9	Cystometry and discuss the normal cystometrogram

**8 Endocrine Physiology ( 14 hours )**

Competency No	Topics & subtopics
PY. 8.1	Physiology of bone and calcium metabolism
PY. 8.2	Synthesis, secretion, transport, physiological actions, regulation and effects of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus
PY. 8.3	Physiology of Thymus & Pineal Gland
PY. 8.4	Function tests: Thyroid gland; Adrenal cortex, Adrenal medulla and pancreas
PY. 8.5	Metabolic and endocrine consequences of obesity & metabolic syndrome, Stressresponse. Outline the psychiatry component pertaining to metabolic syndrome
PY. 8.6	Mechanism of action of steroid, protein and amine hormones

**9 Reproductive Physiology ( 7 hours )**

Competency No	Topics & subtopics
PY. 9.1	Sex determination; sex differentiation and their abnormalities and outline psychiatry and practical implementation of sex determination
PY. 9.2	Puberty: onset, progression, states; early and delayed puberty and outline adolescent clinical and psychological association
PY. 9.3	Male reproductive system: functions of testis and control of spermatogenesis & factors modifying it and outline its association with psychiatric illness
PY. 9.4	Female reproductive system: (a) functions of ovary and its control; (b) menstrual cycle – hormonal, uterine and ovarian changes
PY. 9.5	Physiological effects of sex hormones
PY. 9.6	Contraceptive methods for male and female. Discuss their advantages & disadvantages
PY. 9.7	Effects of removal of gonads on physiological functions
PY. 9.8	Physiology of pregnancy, parturition & lactation and outline the psychology and psychiatry-disorders associated with it
PY. 9.10	Physiological basis of various pregnancy tests
PY. 9.11	Hormonal changes and their effects during perimenopause and menopause
PY. 9.12	Common causes of infertility in a couple and role of IVF in managing a case of infertility

**10 Neurophysiology ( 41 hours )**

Competency No	Topics & subtopics
PY. 10.1	Organization of nervous system
PY. 10.2	Functions and properties of synapse, reflex, receptors
PY. 10.3	Somatic sensations & sensory tracts

PY. 10.4	Motor tracts, mechanism of maintenance of tone, control of body movements, posture and equilibrium & vestibular apparatus
PY. 10.5	Structure and functions of reticular activating system, autonomic nervous system (ANS)
PY. 10.6	Spinal cord, its functions, lesion & sensory disturbances
PY. 10.7	Functions of cerebral cortex, basal ganglia thalamus, hypothalamus. Cerebellum and limbic system and their abnormalities
PY. 10.8	Behavioural and EEG characteristics during sleep and mechanism responsible for its production
PY. 10.9	Physiological basis of memory, learning and speech
PY. 10.10	Chemical transmission in the nervous system. (Outline the psychiatry element)
PY. 10.13	Perception of smell and taste sensation
PY. 10.14	Patho-physiology of altered smell and taste sensation
PY. 10.15	Functional anatomy of ear and auditory pathways & physiology of hearing
PY. 10.16	Pathophysiology of deafness. Hearing tests
PY. 10.17	Functional anatomy of eye, physiology of image formation, physiology of vision including colour vision, refractive errors, colour blindness, physiology of pupil and light reflex
PY. 10.18	Physiological basis of lesion in visual pathway
PY. 10.19	Auditory & visual evoke potentials

## 11 Integrated Physiology ( 8 hours )

Competency No	Topics & subtopics
PY. 11.1	Mechanism of temperature regulation
PY. 11.2	Adaptation to altered temperature (heat and cold)
PY. 11.3	Mechanism of fever, cold injuries and heat stroke
PY. 11.4	Cardio-respiratory and metabolic adjustment during exercise; physical training effects
PY. 11.5	Physiological consequences of sedentary lifestyle
PY. 11.6	Physiology of Infancy
PY. 11.7	Physiology of aging; free radicals and antioxidants
PY. 11.8	Cardio-respiratory changes in exercise (isometric and isotonic) with that in the resting state and under different environmental conditions (heat and cold)
PY. 11.9	Interpretation of growth charts
PY. 11.10	Interpretation of anthropometric assessment of infants
PY. 11.11	Concept, criteria for diagnosis of Brain death and its implications
PY. 11.12	Physiological effects of meditation, *Yogic breathing practices, breathing positions

\*Applicable from 2020-21 Batch onwards

## PRACTICAL COMPETENCIES

Competency Number	COMPETENCY	Suggested Teaching Learning method
<b>Topic: Haematology</b>		
PY2.11	Estimate Hb, RBC, TLC, RBC indices, DLC, Blood groups, BT/CT	DOAP sessions
PY2.12	Describe test for ESR, Osmotic fragility, Hematocrit. Note the findings and interpret the test results etc	Demonstration
<b>Topic: Nerve and Muscle Physiology</b>		
PY3.14	Perform Ergography	DOAP sessions
PY3.15	Demonstrate effect of mild, moderate and severe exercise and record changes in Cardiorespiratory parameters	DOAP sessions
PY3.16	Demonstrate Harvard Step test and describe the impact on induced physiologic parameters in a simulated environment	DOAP sessions
PY3.17	Describe Strength-duration curve	Small group discussion
PY3.18	Observe with Computer assisted learning (i) amphibian nerve - muscle experiments (ii) amphibian cardiac experiments	Demonstration, Computer assisted learning methods
<b>Topic: Gastro-intestinal Physiology</b>		
PY4.10	Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment	DOAP session
<b>Topic: Cardiovascular Physiology (CVS)</b>		
PY5.12	Record blood pressure & pulse at rest and in different grades of exercise and postures in a volunteer or simulated environment	DOAP sessions
PY5.13	Record and interpret normal ECG in a volunteer or simulated environment	DOAP sessions
PY5.14	Observe cardiovascular autonomic function tests in a volunteer or simulated environment	DOAP sessions
PY5.15	Demonstrate the correct clinical examination of the cardiovascular system in a normal volunteer or simulated environment	DOAP sessions
PY5.16	Record Arterial pulse tracing using finger plethysmography in a volunteer or simulated environment	DOAP sessions, Computer assisted learning methods



<b>Topic: Respiratory Physiology</b>		
PY6.8	Demonstrate the correct technique to perform & interpret Spirometry	DOAP sessions
PY6.9	Demonstrate the correct clinical examination of the respiratory system in a normal volunteer or simulated environment	DOAP sessions
PY6.10	Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment	DOAP sessions
<b>Topic: Reproductive Physiology</b>		
PY9.9	Interpret a normal semen analysis report including (a) sperm count, (b) sperm morphology and (c) sperm motility, as per WHO guidelines and discuss the results	Small group discussion
<b>Topic: Neurophysiology</b>		
PY10.11	Demonstrate the correct clinical examination of the nervous system: Higher functions, sensory system, motor system, reflexes, cranial nerves in a normal volunteer or simulated environment	DOAP sessions
PY10.12	Identify normal EEG forms	Small group teaching
PY10.20	Demonstrate (i) Testing of visual acuity, colour and field of vision and (ii) hearing (iii) Testing for smell and (iv) taste sensation in volunteer/ simulated environment	DOAP sessions
<b>Topic: Integrated Physiology</b>		
PY11.9	Interpret growth charts	Small group teaching
PY11.10	Interpret anthropometric assessment of infants	Small group teaching
PY11.13	Obtain history and perform general examination in the volunteer / simulated environment	DOAP sessions
PY11.14	Demonstrate Basic Life Support in a simulated environment	DOAP sessions

<b>Common questions on AETCOM modules - Physiology</b>	
1	Describe professional qualities of a physician.
2	Outlook & Expectations of patient from physician
3	Empathy in patient care.
4	Describe role of a physician in patient care
5	Rights of patients,
6	Responsibilities of patients
7	Human dignity
8	Duties of doctors

### **PAPER WISE TOPIC DISTRIBUTION**

<b>PHYSIOLOGY PAPER-I</b>	
SECTION A	All
SECTION B	General Physiology, Blood, CVS
SECTION C	RS, Endocrine, Reproduction, AETCOM
<b>PHYSIOLOGY PAPER-II</b>	
SECTION A	All
SECTION B	Nerve and Muscle Physiology, GIT, Special senses
SECTION C	CNS, Renal, Integrated Physiology

**MGMIHS**  
**1<sup>st</sup> year MBBS. CBME**  
**Format for Internal assessment examinations**

Sr. No.	Exam	Theory	Practical
1.	Internal assessment examinations	200	100
2.	Preliminary examination	200	100
<b>Total</b>		<b>400</b>	<b>200</b>

- Preliminary examination pattern will be as per University examination
- Respective colleges/ departments will conduct internal assessment examinations and maintain records of the same.

**I MBBS (Anatomy, Physiology & Biochemistry)**

**Time – 3 hrs.**      **Preliminary / University examination**

(\* Applicable from 2020-21 Batch onwards)

**Each subject** – 2 papers (I / II) – 100 X 2 = **Total 200 Marks**

**Each paper** –

- **Section A** – MCQ – 20 X 1 mark = **20 Marks**
  - **10% MCQ i.e. 2 in each paper must be clinical based**

- **Section B** -

Q1. Answer any 5 out of 6 (BAQ) **(5X3 marks =15 marks)**

Q2. Answer any 3 out of 4 (SAQ) **(3X5 marks =15 marks)**

- 1 SAQ will be clinical application based
- 1 SAQ will be from **AETCOM modules (in Paper I)**

Q3. Answer any 1 out of 2(LAQ) **(1X10 marks =10marks)**

➤ LAQ should be structured (With defined marks distribution)

• **Section C** –

Q1. Answer any 5 out of 6 (BAQ) (5X3 marks =15marks)

Q2. Answer any 3 out of 4 (SAQ) (3X5 marks =15 marks)

Q3. Answer any 1 out of 2 (LAQ) (1X10 marks =10marks)

➤ LAQ should be structured (With defined marks distribution)

**Physiology Practical internal assessment exam pattern**

**Midterm & Terminal (50 Marks)**

<b>S.No</b>	<b>Heading</b>	<b>Marks</b>
1.	Haematology	10
2.	Clinical	10
3.	Human Experiment & Spots	10
4.	Communication skill	05
5.	Journal	05
6.	Viva	10
Total =		50

**\*Prelim & University exam (100 Marks)**

<b>Sr. No.</b>	<b>Heading</b>	<b>Marks</b>
1.	Haematology	15
2.	Clinical I (RS & CVS)	15
3.	Clinical II (Abdomen & CNS)	15
4.	Human Experiment (Spirometry, Ergography, Perimetry, Harvard step test, Posture, Mild & moderate exercise effects on Cardiorespiratory system)	10
5.	Spots	20
6.	Communication skill	05
7.	Viva	20
Total =		100

\* Applicable from 2020-21batch onwards.

**Internal assessment calculation**

<b>Sr. No.</b>	<b>Criteria</b>	<b>Theory</b>	<b>Practical</b>
1.	*All internal assessment examinations including preliminary examination	25	10
2.	Day to Day assessment		
	➤ Day to Day assessment (PBL/ TBL/ Seminar/ MCQ test etc)	10	
	➤ Day to Day assessment (Viva/ Spotters/ OSPE / OSVE etc)		5
3.	Logbook	5	
	Journals		5
<b>Total</b>		<b>40</b>	<b>20</b>

**\*Internal assessment examinations marks conversion to internal assessment marks -**

**Theory** – Total 400 marks will be converted to 25

**Practical** – Total 200 marks will be converted to 10



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