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MGM INSTITUTE OF HEALTH SCIENCES

Accredited by NAAC with 'A' Grade

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

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COMPETENCY BASED MEDICAL EDUCATION

(CBME)

(With effect from 2019-20 Batches)

Curriculum for First M.B.B.S

Human Physiology

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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 andresearch.

2 Haematology (15 hours)

Competency No.	Topics & subtopics
PY. 2.2	Original, 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

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, 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

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, Stress response. 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 psychiatricillness
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

PRACTICAL COMPETENCIES

Competency Number	COMPETENCY	Suggested Teaching Learning method
Topic: Haematology		
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
Topic: Nerve and Muscle Physiology		
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
Topic: Gastro-intestinal Physiology		
PY4.10	Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment	DOAP session
Topic: Cardiovascular Physiology (CVS)		
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

Topic: Respiratory Physiology		
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
Topic: Reproductive Physiology		
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
Topic: Neurophysiology		
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
Topic: Integrated Physiology		
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

	Common questions on AETCOM modules - Physiology
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

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

MGMIHS
1st year MBBS. CBME
Format for Internal assessment examinations

Sr. No.	Exam	Theory	Practical
1.	Internal assessment examinations	200	100
2.	Preliminary examination	200	100
Total		**400**	**200**

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

Format of question paper

Time – 3 hrs. Preliminary / University examination

Applicable from 2019-20 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**

- **Section B** -

Q1. **Answer any 5 out of 6 (SAQ)** **(5X3 marks =15 marks)**
- 1 SAQ will be from AETCOM modules

Q2. **Answer any 3 out of 4 (BAQ)** **(3X5 marks =15 marks)**
- 1 SAQ will be clinical application based

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 (SAQ)** **(5X3 marks =15marks)**
Q2. **Answer any 3 out of 4 (BAQ)** **(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)

S.No	Heading	Marks
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)

S.No	Heading	Marks
1.	Haematology	10
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.	Journal	05
8.	Viva	20
	Total =	100

Internal assessment calculation

Sr. No.	Criteria	Theory	Practical
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
Total		**40**	**20**

***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