

Teaching & Evaluation Scheme Physiology

Semester/Year: First Year M.B.B.S.

Program Name: Bachelor of Medicine and Bachelor of Surgery

Effective from Academic Year: 2019-2020

Program Code: MB01

Course Code	Course Name	Hrs/Week			UA		IA		Total	
		L	P	Total	Max	Min	Max	Min	Max	Min
1PY101	Physiology-I	4	-	4	100	40	-	-	200	100
1PY102	Physiology-II	4	-	4	100	40	-	-		
1PY103	Physiology Practical	-	9	9	80	-	-	-	100	50
1PY104	Physiology Viva	-	-	-	20	-	-	-		
1PY105	Physiology IA Theory	-	-	-	-	-	100	40	200	100
1PY106	Physiology IA Practical	-	-	-	-	-	100	40		

NMCRC, I MBBS, PHYSIOLOGY

COMPETENCY BASED CURRICULUM (Theory and Practical)

CURRICULUM (Competency based)

The teaching of Physiology is extended over 13 months.

The teaching program is divided under the following heads:

1. Theory lectures	160 Hours
2. Small group teaching/ Tutorials/ Integrated Learning/ Practicals	310 “
3. Self Directed Learning (SDL)	25 “
TOTAL	495 “

I. Course for theory lectures: Topics (Competencies) :-

1. Introduction and general Physiology including History of Physiology. (8 lectures)

1. Describe the structure and functions of a mammalian cell (PY1.1)
2. Describe and discuss the principles of homeostasis (PY1.2)
3. Describe intercellular communication (PY1.3)
4. Describe apoptosis – programmed cell death (PY1.4)
5. Describe and discuss transport mechanisms across cell membranes (PY1.5)
6. Describe the fluid compartments of the body, its ionic composition & measurements (PY1.6)
7. Describe the concept of pH & Buffer systems in the body (PY1.7)
8. Describe and discuss the molecular basis of resting membrane potential and action potential in excitable tissue (PY1.8)

2. Muscle and Nerve Physiology. (12 lectures)

1. Describe the structure and functions of a neuron and neuroglia; Discuss Nerve Growth Factor & other growth factors/cytokines (PY3.1)
2. Describe the types, functions & properties of nerve fibers (PY3.2)
3. Describe the degeneration and regeneration in peripheral nerves (PY3.3)
4. Describe the structure of neuro-muscular junction and transmission of impulses (PY3.4)
5. Discuss the action of neuro-muscular blocking agents (PY3.5)
6. Describe the pathophysiology of Myasthenia gravis (PY3.6)
7. Describe the different types of muscle fibres and their structure (PY3.7)
8. Describe action potential and its properties in different muscle types (skeletal & smooth) (PY3.8)
9. Describe the molecular basis of muscle contraction in skeletal and in smooth muscles (PY3.9)
10. Describe the mode of muscle contraction (isometric and isotonic) (PY3.10)
11. Explain energy source and muscle metabolism (PY3.11)
12. Explain the gradation of muscular activity (PY3.12)
13. Describe muscular dystrophy: myopathies (PY3.13)
14. Describe Strength-duration curve (PY3.17)

3. Blood and lymph . (14 lectures)

1. Describe the composition and functions of blood components (PY2.1)
2. Discuss the origin, forms, variations and functions of plasma proteins (PY2.2)
3. Describe and discuss the synthesis and functions of Haemoglobin and explain its breakdown. Describe variants of haemoglobin (PY2.3)

4. Describe RBC formation (erythropoiesis & its regulation) and its functions(PY2.4)
5. Describe different types of anaemias & Jaundice(PY2.5)
6. Describe WBC formation (Granulopoiesis) and its regulation(PY2.6)
7. Describe the formation of platelets, functions and variations(PY2.7)
8. Describe the physiological basis of hemostasis and, anticoagulants. Describe bleeding & clotting disorders (Hemophilia, purpura) (PY2.8)
9. Describe different blood groups and discuss the clinical importance of blood grouping, blood banking and transfusion(PY2.9)
10. Define and classify different types of immunity. Describe the development of immunity and its regulation(PY2.10)

4. Cardiovascular System.

(20 lectures)

1. Describe the functional anatomy of heart including chambers, sounds; and Pacemaker tissue and conducting system (PY5.1)
2. Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions(PY5.2)
3. Discuss the events occurring during the cardiac cycle(PY5.3)
4. Describe generation, conduction of cardiac impulse(PY5.4)
5. Describe the physiology of electrocardiogram(E.C.G),its applications and the cardiac axis(PY5.5)
6. Describe abnormal ECG, arrhythmias, heart block and myocardial Infarction(PY5.6)
7. Describe and discuss hemodynamics of circulatory system(PY5.7)
8. Describe and discuss local and systemic cardiovascular regulatory mechanisms(PY5.8)
9. Describe the factors affecting heart rate, regulation of cardiac output & blood pressure(PY5.9)
10. Describe & discuss regional circulation including microcirculation,lymphatic, circulation ,coronary, cerebral, capillary, skin ,foetal, pulmonary and splanchnic circulation (PY5.10)
11. Describe the Pathophysiology of shock, syncope and heart failure (PY5.11)

5. Respiratory System:

(12 lectures)

1. Describe the functional anatomy of respiratory tract(PY6.1)
2. Describe the 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(PY6.2)
3. Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide(PY6.3)
4. Describe and discuss the physiology of high altitude and deep sea diving(PY6.4)

5. Describe and discuss the principles of artificial respiration, oxygen therapy, acclimatization and decompression sickness(PY6.7)

6. Describe and discuss the patho-physiology of dyspnoea, hypoxia, cyanosis asphyxia; drowning, periodic breathing(PY6.8)

7. Describe and discuss lung function tests & their clinical significance(PY6.9)

6. Digestive system

(13 lectures)

1. Describe the structure and functions of digestive system(PY4.1)

2. Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion(PY4.2)

3. Describe GIT movements, regulation and functions. Describe defecation reflex. Explain role of dietary fiber(PY4.3)

4. Describe the physiology of digestion and absorption of nutrients(PY4.4)

5. Describe the source of GIT hormones, their regulation and functions(PY4.5)

6. Describe the Gut-Brain Axis(PY4.6)

7. Describe & discuss the structure and functions of liver and gall bladder(PY4.7)

8. Describe & discuss gastric function tests, pancreatic exocrine function tests & liver function tests(PY4.8)

9. Discuss the physiology aspects of: peptic ulcer, gastro oesophageal reflux disease, vomiting, diarrhoea, constipation, A dynamic ileus, Hirschsprung's disease(PY4.9)

7. Excretory system

(12 lectures)

1. Describe structure and function of kidney(PY7.1)

2. Describe the structure and functions of juxtaglomerular apparatus and role of renin-angiotensin system(PY7.2)

3. Describe the mechanism of urine formation involving processes of filtration, tubular reabsorption & secretion; concentration and diluting mechanism(PY7.3)

4. Describe & discuss the significance & implication of Renal clearance(PY7.4)

5. Describe the renal regulation of fluid and electrolytes & acid-base balance(PY7.5)

6. Describe the innervations of urinary bladder, physiology of micturition and its abnormalities(PY7.6)

7. Describe artificial kidney, dialysis and renal transplantation(PY7.7)

8. Describe & discuss Renal Function Tests(PY7.8)

9. Describe cystometry and discuss the normal cystometrogram. (PY7.9)

8. Endocrines

(15 lectures)

1. Describe the physiology of bone and calcium metabolism (PY8.1)
2. Describe the synthesis, secretion, transport, physiological actions, regulation and effect of altered (hypo and hyper) secretion of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas and hypothalamus (PY8.2)
3. Describe the physiology of Thymus & Pineal Gland (PY8.3)
4. Describe function tests: Thyroid gland; Adrenal cortex, Adrenal medulla and pancreas (PY8.4)
5. Describe the metabolic and endocrine consequences of obesity & metabolic syndrome, Stress response. Outline the psychiatry component pertaining to metabolic syndrome (PY8.5)
6. Describe & differentiate the mechanism of action of steroid, protein and amine hormones (PY8.6)

9. Reproduction

(6 lectures)

1. Describe and discuss sex determination; sex differentiation and their abnormalities and outline psychiatry and practical implication of sex determination (PY9.1)
2. Describe and discuss puberty: onset, progression, stages; early and delayed puberty and outline adolescent clinical and psychological association (PY9.2)
3. Describe male reproductive system: functions of testis and control of spermatogenesis & factors modifying it and outline its association with psychiatric illness (PY9.3)
4. Describe female reproductive system: (a) functions of ovary and its control; (b) menstrual cycle - hormonal, uterine and ovarian changes (PY9.4)
5. Describe and discuss the physiological effects of sex hormones (PY9.5)
6. Enumerate the contraceptive methods for male and female. Discuss their advantages & disadvantages (PY9.6)
7. Describe and discuss the effects of removal of gonads on physiological functions (PY9.7)
8. Describe and discuss the physiology of pregnancy, parturition & lactation and outline the psychology and psychiatry-disorders associated with it (PY9.8)
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 (PY9.9)
10. Discuss the physiological basis of various pregnancy tests (PY9.10)
11. Discuss the hormonal changes and their effects during peri menopause and menopause (PY9.11)
12. Discuss the common causes of infertility in a couple and role of IVF in managing a case of infertility (PY9.12)

10. Central Nervous system including autonomic nervous system

(30 lectures)

1. Describe and discuss the organization of nervous system (PY10.1)
2. Describe and discuss the functions and properties of synapse, reflex, receptors (PY10.2)

3. Describe and discuss somatic sensations & sensory tracts(PY10.3)
4. Describe and discuss motor tracts, mechanism of maintenance of tone, control of body movements, posture and equilibrium & vestibular apparatus(PY10.4)
5. Describe and discuss structure and functions of reticular activating system, autonomic nervous system (ANS) (PY10.5)
6. Describe and discuss Spinal cord, its functions, lesion & sensory disturbances (PY10.6)
7. Describe and discuss functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities (PY10.7)
8. Describe and discuss behavioural and EEG characteristics during sleep and mechanism responsible for its production(PY10.8)
9. Describe and discuss the physiological basis of memory, learning and speech(PY10.9)
10. Describe and discuss chemical transmission in the nervous system. (Outline the psychiatry element) (PY10.10)

11. Special senses

(10 lectures)

1. Describe and discuss perception of smell and taste sensation (PY10.13)
2. Describe and discuss patho-physiology of altered smell and taste sensation(PY10.14)
3. Describe and discuss functional anatomy of ear and auditory pathways & physiology of hearing(PY10.15)
4. Describe and discuss pathophysiology of deafness. Describe hearing tests(PY10.16)
5. Describe and discuss functional anatomy of eye ,physiology of image formation ,physiology of vision including colour vision, refractive errors ,colour blindness, physiology of pupil and light reflex(PY10.17)
6. Describe and discuss the physiological basis of lesion in visual pathway(PY10.18)
7. Describe and discuss auditory & visual evoke potentials(PY10.19)

12. Integrated Physiology

(08 lectures)

1. Describe and discuss mechanism of temperature regulation(PY11.1)
2. Describe and discuss adaptation to altered temperature(heat and cold) (PY11.2)
3. Describe and discuss mechanism of fever, cold injuries and heat stroke(PY11.3)
4. Describe and discuss cardio-respiratory and metabolic adjustments during exercise; physical training effects(PY11.4)
5. Describe and discuss physiological consequences of sedentary lifestyle(PY11.5)
6. Describe physiology of Infancy(PY11.6)
7. Describe and discuss physiology of aging; free radicals and antioxidants(PY11.7)

8. Discuss & compare cardio-respiratory changes in exercise (isometric and isotonic) with that in the resting state and under different environmental conditions (heat and cold) (PY11.8)
9. Discuss the concept, criteria for diagnosis of Brain death and its implications (PY11.11)
10. Discuss the physiological effects of meditation (PY11.12)

PRACTICALS (DOAP, SDL, Small Group Teaching) 335 hours.

1. Estimate Hb, RBC, TLC, RBC indices, DLC, Blood groups, BT/CT (PY2.11)
2. Perform Ergography (PY3.14)
3. Demonstrate effect of mild, moderate and severe exercise and record changes in cardiorespiratory parameters(PY3.15)
4. Demonstrate Harvard Step test and describe the impact on induced physiologic parameters in a simulated environment(PY3.16)
5. Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment(PY4.10)
6. Record blood pressure & pulse at rest and in different grades of exercise and postures in a volunteer or simulated environment(PY5.12)
7. Record and interpret normal ECG in a volunteer or simulated environment(PY5.13)
8. Observe cardiovascular autonomic function tests in a volunteer or simulated environment(PY5.14)
9. Demonstrate the correct clinical examination of the cardiovascular system in a normal volunteer or simulated environment(PY5.15)
10. Record Arterial pulse tracing using finger plethysmography in a volunteer or simulated environment(PY5.16)
11. Demonstrate the correct technique to perform & interpret Spirometry(PY6.8)
12. Demonstrate the correct clinical examination of the respiratory system in a normal volunteer or simulated environment(PY6.9)
13. Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment(PY6.10)
14. 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(PY10.11)
15. Identify normal EEG form(PY10..12)
16. 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 (PY10.20)
17. Obtain history and perform general examination in the volunteer / simulated environment(PY11.13)

DEMONSTRATIONS

1. Describe test for ESR, Osmotic fragility, Hematocrit. Note the findings and interpret the test results etc(PY2.12)
2. Describe steps for reticulocyte and platelet count(PY2.13)
3. Observe with Computer assisted learning (i) amphibian nerve - muscle experiments (ii) amphibian cardiac experiments(PY3.18)

4. Describe & discuss gastric function tests, pancreatic exocrine function tests & liver function tests (Esophageal Manometry & endoscopy) (PY4.8)

5. Demonstrate Basic Life Support in a simulated environment (PY11.14)