

4. Amendment to Ordinance V (2) & VII. [E.C Res. 15-6 dated 31.08.2021]

COURSE CONTENT OF HUMAN PHSYIOLOGY

General Physiology

- PY1.1 Describe the structure and functions of a mammalian cell
- PY1.2 Describe and discuss the principles of homeostasis
- PY1.3 Describe intercellular communication
- PY1.4 Describe apoptosis – programmed cell death
- PY1.5 Describe and discuss transport mechanisms across cell membranes
- PY1.6 Describe the fluid compartments of the body, its ionic composition & measurements
- PY1.7 Describe the concept of pH & Buffer systems in the body
- PY1.8 Describe and discuss the molecular basis of resting membrane potential and action potential in excitable tissue
- PY1.9 Demonstrate the ability to describe and discuss the methods used to demonstrate the functions of the cells and its products, its communications and their applications in Clinical care and research.

Haematology

- PY2.1 Describe the composition and functions of blood components
- PY2.2 Discuss the origin, forms, variations and functions of plasma proteins
- PY2.3 Describe and discuss the synthesis and functions of Haemoglobin and explain its breakdown. Describe variants of haemoglobin
- PY2.4 Describe RBC formation (erythropoiesis & its regulation) and its functions

- PY2.5 Describe different types of anaemias & Jaundice
- PY2.6 Describe WBC formation (granulopoiesis) and its regulation
- PY2.7 Describe the formation of platelets, functions and variations.
- PY2.8 Describe the physiological basis of hemostasis and, anticoagulants. Describe bleeding & clotting disorders (Hemophilia, purpura)
- PY2.9 Describe different blood groups and discuss the clinical importance of blood grouping, blood banking and transfusion
- PY2.10 Define and classify different types of immunity. Describe the development of immunity and its regulation
- PY2.11 Estimate Hb, RBC, TLC, RBC indices, DLC, Blood groups, BT/CT
- PY2.12 Describe test for ESR, Osmotic fragility, Hematocrit. Note the findings and interpret the test results etc.
- PY2.13 Describe steps for reticulocyte and platelet count

Nerve and Muscle Physiology

- PY3.1 Describe the structure and functions of a neuron and neuroglia; Discuss Nerve Growth Factor & other growth factors/cytokines
- PY3.2 Describe the types, functions & properties of nerve fibers
- PY3.3 Describe the degeneration and regeneration in peripheral
- PY3.4 Describe the structure of neuro-muscular junction and transmission of impulses
- PY3.5 Discuss the action of neuro-muscular blocking agents
- PY3.6 Describe the pathophysiology of Myasthenia gravis
- PY3.7 Describe the different types of muscle fibres and their structure
- PY3.8 Describe action potential and its properties in different muscle types (skeletal & smooth)
- PY3.9 Describe the molecular basis of muscle contraction in skeletal and in smooth muscles
- PY3.10 Describe the mode of muscle contraction (isometric and isotonic)
- PY3.11 Explain energy source and muscle metabolism
- PY3.12 Explain the gradation of muscular activity
- PY3.13 Describe muscular dystrophy:
- PY3.14 Perform Ergography
- PY3.15 Demonstrate effect of mild, moderate and severe exercise and record changes in cardiorespiratory parameters
- PY3.16 Demonstrate Harvard Step test and describe the impact on induced physiologic parameters in a simulated environment
- PY3.17 Describe Strength-duration curve
- PY3.18 Observe with Computer assisted learning (i) amphibian nerve -muscle experiments (ii) amphibian cardiac experiments

Gastrointestinal Physiology

- PY4.1 Describe the structure and functions of digestive system
- PY4.2 Describe the composition, mechanism of secretion, functions, and regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion
- PY4.3 Describe GIT movements, regulation and functions. Describe defecation reflex. Explain role of dietary fibre.
- PY4.4 Describe the physiology of digestion and absorption of nutrients. Describe the source of GIT hormones, their regulation and functions



- PY4.5 Describe the Gut-Brain Axis
- PY4.6 Describe & discuss the structure and functions of liver and gall bladder
- PY4.7 Describe & discuss gastric function tests, pancreatic exocrine function tests & liver function tests
- PY4.8 Discuss the physiology aspects of: peptic ulcer, gastrooesophageal reflux disease, vomiting, diarrhoea, constipation, Adynamic ileus, Hirschsprung's disease
- PY4.9 Demonstrate the correct clinical examination of the abdomen in a normal volunteer or simulated environment

Cardiovascular Physiology

- PY5.1 Describe the functional anatomy of heart including chambers, sounds; and Pacemaker tissue and conducting system.
- PY5.2 Describe the properties of cardiac muscle including its morphology, electrical, mechanical and metabolic functions
- PY5.3 Discuss the events occurring during the cardiac cycle
- PY5.4 Describe generation, conduction of cardiac impulse
- PY5.5 Describe the physiology of electrocardiogram (E.C.G), its applications and the cardiac axis
- PY5.6 Describe abnormal ECG, arrhythmias, heart block and myocardial Infarction
- PY5.7 Describe and discuss haemodynamics of circulatory system
- PY5.8 Describe and discuss local and systemic cardiovascular regulatory mechanisms
- PY5.9 Describe the factors affecting heart rate, regulation of cardiac output & blood pressure
- PY5.10 Describe & discuss regional circulation including microcirculation, lymphatic circulation, coronary, cerebral, capillary, skin, foetal, pulmonary and splanchnic circulation
- PY5.11 Describe the patho-physiology of shock, syncope and heart failure
- PY5.12 Record blood pressure & pulse at rest and in different grades of exercise and postures in a volunteer or simulated environment
- PY5.13 Record and interpret normal ECG in a volunteer or simulated environment
- PY5.14 Observe cardiovascular autonomic function tests in a volunteer or simulated environment
- PY5.15 Demonstrate the correct clinical examination of the cardiovascular system in a normal volunteer or simulated environment
- PY5.16 Record Arterial pulse tracing using finger plethysmography in a volunteer or simulated environment

Respiratory Physiology

- PY6.1 Describe the functional anatomy of respiratory tract
- PY6.2 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
- PY6.3 Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide
- PY6.4 Describe and discuss the physiology of high altitude and deep sea diving
- PY6.5 Describe and discuss the principles of artificial respiration, oxygen therapy, acclimatization and decompression sickness.
- PY6.6 Describe and discuss the pathophysiology of dyspnoea, hypoxia, cyanosis asphyxia; drowning, periodic breathing
- PY6.7 Describe and discuss lung function tests & their clinical significance
- PY6.8 Demonstrate the correct technique to perform & interpret Spirometry
- PY6.9 Demonstrate the correct clinical examination of the respiratory system in a normal volunteer



or simulated environment

PY6.10 Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment

Renal Physiology

- PY7.1 Describe structure and function of kidney
- PY7.2 Describe the structure and functions of juxta glomerular apparatus and role of renin-angiotensin system
- PY7.3 Describe the mechanism of urine formation involving processes of filtration, tubular reabsorption & secretion; concentration and diluting mechanism
- PY7.4 Describe & discuss the significance & implication of Renal clearance
- PY7.5 Describe the renal regulation of fluid and electrolytes & acid-base balance
- PY7.6 Describe the innervations of urinary bladder, physiology of micturition and its abnormalities
- PY7.7 Describe artificial kidney, dialysis and renal transplantation
- PY7.8 Describe & discuss Renal Function Tests
- PY7.9 Describe cystometry and discuss the normal cystometrogram

Endocrine Physiology

- PY8.1 Describe the physiology of bone and calcium metabolism
- PY8.2 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
- PY8.3 Describe the physiology of Thymus & Pineal Gland
- PY8.4 Describe function tests: Thyroid gland; Adrenal cortex, Adrenal medulla and pancreas
- PY8.5 Describe the metabolic and endocrine consequences of obesity & metabolic syndrome, Stress response. Outline the psychiatry component pertaining to metabolic syndrome.
- PY8.6 Describe & differentiate the mechanism of action of steroid, protein and amine hormones

Reproductive Physiology

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



PY9.11 Discuss the hormonal changes and their effects during perimenopause and menopause

PY9.12 Discuss the common causes of infertility in a couple and role of IVF in managing a case of infertility.

Neurophysiology

PY10.1 Describe and discuss the organization of nervous system

PY10.2 Describe and discuss the functions and properties of synapse, reflex, receptors

PY10.3 Describe and discuss somatic sensations & sensory tracts

PY10.4 Describe and discuss motor tracts, mechanism of maintenance of tone, control of body movements, posture and equilibrium & vestibular apparatus

PY10.5 Describe and discuss structure and functions of reticular activating system, autonomic nervous system (ANS)

PY10.6 Describe and discuss Spinal cord, its functions, lesion & sensory disturbances

PY10.7 Describe and discuss functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system and their abnormalities

PY10.8 Describe and discuss behavioural and EEG characteristics during sleep and mechanism responsible for its production

PY10.9 Describe and discuss the physiological basis of memory, learning and speech

PY10.10 Describe and discuss chemical transmission in the nervous system. (Outline the psychiatry element).

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

PY10.12 Identify normal EEG forms S S Y Small group teaching OSPE/Viva voce Psychiatry

PY10.13 Describe and discuss perception of smell and taste sensation

PY10.14 Describe and discuss patho-physiology of altered smell and taste sensation

PY10.15 Describe and discuss functional anatomy of ear and auditory pathways & physiology of hearing

PY10.16 Describe and discuss pathophysiology of deafness. Describe hearing tests

PY10.17 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

PY10.18 Describe and discuss the physiological basis of lesion in visual pathway

PY10.19 Describe and discuss auditory & visual evoke potentials

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

Integrated Physiology

PY11.1 Describe and discuss mechanism of temperature regulation

PY11.2 Describe and discuss adaptation to altered temperature (heat and cold)

PY11.3 Describe and discuss mechanism of fever, cold injuries and heatstroke

PY11.4 Describe and discuss cardio-respiratory and metabolic adjustments during exercise; physical training effects

PY11.5 Describe and discuss physiological consequences of sedentary lifestyle

PY11.6 Describe physiology of Infancy

PY11.7 Describe and discuss physiology of aging; free radicals and antioxidants

PY11.8 Discuss & compare cardio-respiratory changes in exercise (isometric and isotonic) with that

- in the resting state and under different environmental conditions (heat and cold)
- PY11.9 Interpret growth charts
 - PY11.10 Interpret anthropometric assessment of infants
 - PY11.11 Discuss the concept, criteria for diagnosis of Brain death and its implications
 - PY11.12 Discuss the physiological effects of meditation
 - PY11.13 Obtain history and perform general examination in the volunteer/simulated environment
 - PY11.14 Demonstrate Basic Life Support in a simulated environment

- **TEACHING LEARNING METHODS**

- Interactive lectures
- DOAP (Demonstration-Observation - Assistance- Performance) Sessions: Hematology experiments, Human experiments including Clinical examination, Computer assisted learning of frog and mammalian experiments, Demonstration of some human experiments
- Small Group Discussions
- Student seminars
- Graphs and charts to be made in the departments to teach different principles of physiology, as well as pathophysiology, and to provide problem-solving exercises.
- Early Clinical Exposure
- Self-Directed Learning

Integration

Efforts are to be made to encourage integrated teaching between medical subjects. At the end of this teaching the student shall acquire an Integrated knowledge of organ structure, physiological and biochemical function, its regulatory mechanisms, its pathophysiology and principles of management.

AETCOM Modules

AETCOM (Attitude, Ethics & Communication) modules for the first year would be taught through various teaching learning methodologies and would also be assessed.

- **ASSESSMENT**

- a) **Formative Assessment:** Formative assessment shall be done periodically throughout the course.
 - i) **Log Book:** Log book is to be maintained to record all activities like seminar, symposia, early clinical exposure, AETCOM modules and other academic activities. It has to be submitted to the department regularly and would be assessed regularly.
 - ii) **Certifiable competencies:** Achievement of certifiable competencies would also be recorded in logbooks. The student must have completed the required certifiable competencies and completed the log book to be eligible for appearing at the final university examination.
- b) **Internal Assessment:**
 - i) No less than three internal assessment exams shall be conducted during the course.
 - ii) Up To twenty percent IA marks (Theory and Practical) would be from Log book assessment.
 - iii) 50% combined in theory and practical (not less than 40% in each) for eligibility for appearing for University Examinations.

c) Summative Assessment:

University (Professional) examination: Will have Theory, viva and practical examinations.

i) THEORY PAPERS

There shall be two theory papers. The student must secure at least 40% marks in each of the papers with minimum 50% of marks in aggregate (both papers together) to pass. Each paper shall be of 03 hours duration and 100 marks.

THEORY PAPER - PHYSIOLOGY

PAPER – I (100 Marks)

Topics:

Blood, CVS, Respiration, Kidney, GIT including Nutrition, and Integrated Physiology

PAPER – II (100 Marks)

Topics:

Gen Physiology, Nerve – Muscle Physiology, CNS, Special Senses, Endocrines, Reproduction and Integrated Physiology

THEORY QUESTION PAPER FORMAT

(Applicable for Paper- I and Paper-II)

Part I

Q 1. Objective Type Questions including MCQs 10*2=20

Part II

Q 2a. Long structure question / Problem based question 10
Q 2b. Physiological / Clinical significance 4 * 2.5 = 10
Q 3. Write Short Notes 4 * 5= 20

Part III

Q4 a. Long structure question / Problem based question 10
Q4 b. Explain the following: 4*2.5 = 10
Q5. Describe Briefly / Short notes 4*5 = 20

ii) PRACTICALS & VIVA

1. Spotting/OSPE 10 marks
2. Problem solving exercise 10 marks
3. Graph and charts 05 marks
(including those pertaining to Amphibian nerve muscle and heart experiments)
4. Human Experiment 15 marks

| | | |
|--------------------------|--------------------|------------------|
| 5. Haematology | | 15 marks |
| 6. Clinical Exercise | | 10 marks |
| 7. Practical record book | | 05 marks |
| | Total | 70 marks |
| | VIVA | 30 marks |
| | Grand Total | 100 marks |

Note:

Internal Assessment: 50% combined in theory and practical (not less than 40% in each) for eligibility for appearing for University Examinations

University Examination: Mandatory 50% marks in theory and practical (theory=theory paper(s) only) (practical= practical/clinical + viva)

Internal assessment marks are not to be added to marks of the University examinations and should be shown separately in the grade card.

A candidate obtaining 75% marks in theory plus practicals shall be declared to have passed the subjects with Honors.

A maximum number of four permissible attempts would be available to clear the first Professional University examination, whereby the first Professional course will have to be cleared within 4 years of admission to the said course. Partial attendance at any University examination shall be counted as an availed attempt.