

Physiology

Departmental Objectives

At the end of the course in physiology the **MBBS** students will be able to:

- Demonstrate basic knowledge on the normal functions of human body and apply it as a background for clinical subjects.
- Explain normal reactions to environment and homeostatic mechanism.
- Interpret normal function with a view to differentiate from abnormal function.
- Demonstrate knowledge & skill for performing and interpreting physiological experiments.
- Develop knowledge and skill to proceed to higher studies and research in physiology in relation to need and disease profile of the country.
- Develop sound attitude for continuing self-education to improve efficiency & skill [including information technology (IT) skill] in physiology.

Competencies in Physiology:

Medical courses in physiology teach the essentials of the processes of life.

The physiology courses are very clinically relevant because the knowledge of the processes underlying the normal physiological functions of all the major organ systems is crucial for understanding pathology, pharmacology, and for competent clinical practice. In fact, all of medicine is based on understanding physiological functions.

In the process of completing these courses, students acquire the following competencies:

- Describe transport across the plasma membrane, the basis of resting membrane potential, the genesis and propagation of action potentials. Explain muscle excitation and contraction.
- Describe the heart and circulation starting from a molecular level and ending with how the circulatory system functions as a dual pump and dual circulatory system.
- Explain respiratory processes with the knowledge of structures, ventilation, diffusion, blood flow, gas transport, mechanics of breathing, and control of ventilation.
- Identify how the kidney plays an important role in the maintenance of homeostasis by regulating both the composition and volume of ECF compartment.
- Explain how the brain works at the neuronal systems level. The role of electrical & chemical signals in information transmission & processing. Brain circulation, metabolism, neurotransmitter release & receptors,
- Describe the physiological mechanism underlying sensory perception, motor control & maintenance of homeostasis as well as higher cortical functions. Understanding autonomic nervous system.
- Describe endocrine physiology: describe the synthesis, secretion, functions & mechanism of action of the endocrine hormones.
- Explain human reproduction, functional changes in the reproductive tract, the formation of sperm & ovum, fertilization & hormonal regulation of fertility, role of hormones in pregnancy, parturition & lactation.
- The students will be able to equip themselves with adequate knowledge and develop skill for performing physiology laboratory tests and interpreting these normal functions with a view to differentiate from abnormal conditions. such as
- Measurement of blood pressure
- Examination of radial pulse.
- Recording & analysis of normal ECG (electrocardiogram)(12 Lead).
- Auscultation of heart sounds, breath sounds & bowel sound.
- Estimation of Hb concentration.
- Estimation of total count of red blood cell (RBC).
- Estimation of total and differential count of white blood cell (WBC).
- Determination of bleeding time & clotting time.
- Determination of blood grouping & cross matching.

- Determination of erythrocyte sedimentation rate (ESR).
- Determination of packed cell volume.
- Measurement of pulmonary volumes & capacities.
- Examination of urine for volume, specific gravity/osmolality and water diuresis.
- Elicitation of reflexes (e.g., knee jerk, ankle jerk, planter response, biceps jerk, triceps jerk).
- Recording of body temperature.
- Elicitation of light reflex.
- Interpretation of Snellen's chart and colour vision chart.
- Conduction and interpretation of Rinne test.
- Conduction and interpretation of Weber test.
- Develop competencies in IT, related to applied physiology,

Organization of the Course:

The course is offered in 3 terms (1st, 2nd & 3rd) total 1&1/2 years for phase –1 MBBS Course.

Distribution of teaching - learning hours

Lecture	Tutorial	Practical	Total Teaching hours	Integrated teaching for Phase I	Formative Exam		Summative exam	
					Preparatory leave	Exam time	Preparatory leave	Exam time
120 hrs	120 hrs	100 hrs	340 hrs	30hrs	35 days	42 days	30days	30 days
<i>(Time for exam. preparatory leave and formative & summative assessment is common for all subjects of the phase)</i>								

Teaching/learning methods, teaching aids and evaluation

Teaching Methods			Teaching aids	In course evaluation
Large group	Small group	Self learning		
Lecture Integrated teaching	Tutorial Practical Demonstration	Assignment, self assessment & self study.	Computer & Multimedia & other IT materials Chalk & board White board & markers OHP Slide projector Flip Chart Models Specimens projector Study guide & manuals.	Item examination(oral) Practical item examination(Oral & practical) Class examination Card completion Examination (Written & oral) Term final Examination(Written, oral & practical)

1st Professional Examination:

Marks distribution of Assessment of Physiology

Total marks – 400 (Summative)

- Written= 200 (SAQ140 + MCQ 40+Formative 20)
- SOE =100
- Practical= 100 (OSPE40 + Traditional 50 +Note Book 10)

Related Equipments:

Microscope, test tube, glass slide, centrifuge machine, micro pipette, thermostatic water bath, chemicals & reagents, Sphygmomanometer, Stethoscope, Kymograph, ECG machine, Spirometer, Pneumograph, Peak flow meter, Urinometer clinical hammer, cotton, pin, clinical thermometer, spirit, pencil, torch, Ishihara charts, Snellen's chart, tuning fork, perimeter, models, specimens, Haemocytometer, Shahlis haemometer, haematocrit tube, westergren ESR tube & ESR stand etc.

Learning Objectives and Course Contents in Physiology

Cellular Physiology

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to explain about :</p> <ul style="list-style-type: none"> • goal of physiology. • principles of homeostasis • functional organization of the human body & cell physiology. • cell membrane transport. • membrane potential, resting membrane potential and action potential. • muscle physiology • neuromuscular junction. 	<p>CORE:</p> <ul style="list-style-type: none"> • Physiology: definition, goal & importance of physiology. • Homeostasis: definition, major functional systems, control systems and regulation of the body function. • The cell: functions of cell membrane and cell organelles. • The cell membrane transport: active & passive transport, exocytosis & endocytosis, intercellular communication, • Membrane potential: definition, basic physics of membrane potential. Resting membrane potential. • Action potential: definition & propagation of action potential. • Mechanism of skeletal muscle contraction & relaxation. • Neuromuscular junction: transmission of impulse from nerve ending to muscle fibre. 	<p>L=5 T=6 P=2 IT=1</p>

Physiology of Blood

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> • describe the composition & functions of blood. • demonstrate knowledge about plasma proteins. • demonstrate knowledge about the formation , morphology, types & functions of RBC,WBC & platelets. • describe synthesis & breakdown of haemoglobin. • demonstrate knowledge about the blood grouping & blood transfusion. • describe about hemostasis & coagulation. • describe about the bleeding disorders. 	<p>CORE:</p> <ul style="list-style-type: none"> • Blood: composition & functions. • Plasma proteins: origin, normal values, properties, functions & effect of hypoproteinaemia • Development and normal values of formed elements. • RBC: erythropoiesis. • Hemoglobin: synthesis, types, functions & fate of hemoglobin. • Red blood cell indices, • Anaemia, Polycythemia & Jaundice: definition & classification. • WBC: Classification, morphology, properties & functions, leucocytosis, leucopenia. • Platelet: morphology & functions. • Hemostasis: definition & events. • Coagulation: definition, mechanism, • Clotting factors & fibrinolysis • Blood grouping: ABO & Rh system • Hazards of blood transfusion & Rh incompatibility. <p>Additional/Applied Physiology</p> <ul style="list-style-type: none"> • Bleeding disorder: thrombocytopenic purpura & hemophilia, tests for bleeding disorder 	<p>L=15 T=16 P=48 IT=01</p>

Cardiovascular Physiology

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to :</p> <ul style="list-style-type: none"> • describe the physiology of cardiac muscle • describe the rhythmical excitation of the heart. • demonstrate knowledge about events of cardiac cycle. • explain about the heart sounds. • explain about a normal ECG. • describe about hemodynamics. • describe local & humoral control of blood flow by the tissues. • describe the microcirculation, capillary fluid & interstitial fluid • describe about cardiodynamics: cardiac output, venous return & peripheral resistance. • explain about the heart rate & radial pulse. • describe the regulation of blood pressure. • demonstrate knowledge about the coronary circulation. • demonstrate knowledge about shock • describe the circulatory changes during exercise. 	<p>CORE :</p> <ul style="list-style-type: none"> • Cardiac muscle: physiological anatomy, properties. • Junctional tissues of the heart: generation of cardiac impulse & its conduction. • Cardiac cycle: events, pressure & volume changes during different phases • Heart sounds: types & characteristics • ECG: principles, characteristics & interpretations • Functional classification of blood vessels & microcirculation • Interrelationship among pressure, flow & resistance. • Local & humoral control of blood flow by the tissue. • Exchange of fluid through the capillary membrane. • SV, EDV, ESV: definition & factors affecting them. • Cardiac output: definition, measurement, regulation and factors affecting cardiac output. • Venous return: definition & factors affecting. • Peripheral resistance: definition & factors affecting. • Heart rate: definition, normal values, factors affecting & regulation. • Radial pulse: definition & characteristics. • Blood pressure: definition, types, measurement & regulation of arterial blood pressure. <p>Additional /Applied Physiology Circulatory adjustment during exercise. Coronary circulation Cardiac arrhythmias: tachycardia, bradycardia & heart block Shock: definition, classification. Physiological basis of compensatory mechanism of circulatory shock.</p>	<p>L=18 T=18 P=18 IT=02</p>

Respiratory Physiology

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to :</p> <ul style="list-style-type: none"> • define pulmonary & alveolar ventilation. • explain the mechanism of respiration • describe pulmonary volumes and capacities, • describe pulmonary circulation • summaries the diffusion of gases through the respiratory membrane. • describe the oxygen & carbon dioxide transport. • describe the respiratory centers & regulation of respiration. • define & classify hypoxia and cyanosis. 	<p>CORE</p> <ul style="list-style-type: none"> • Physiological anatomy of respiratory system • Respiration: definition, mechanism. • Pulmonary & Alveolar ventilation. • Pulmonary volumes and capacities (spirometry) • Dead space: definition & types • Pulmonary circulation- pressure in pulmonary system effect of hydrostatic pressure in lungs, pulmonary capillary dynamics. • Composition of atmospheric, alveolar, inspired and expired air. • Respiratory unit and respiratory membrane. • Diffusion of Gases through the respiratory membrane. • Transport of Oxygen & Carbon dioxide in blood & body fluid. Oxy-hemoglobin dissociation curve. Bohr effect, Haldane effect & chloride shift mechanism. • Respiratory centers: name, location & functions. • Nervous & chemical regulation of respiration. • Lung function tests: name, significance • Hypoxia: definition, types • Cyanosis: definition & types. • Definition of Dyspnea, Hypercapnea & Periodic breathing. <p>Additional/Applied Physiology</p> <ul style="list-style-type: none"> • Oxygen therapy in hypoxia • Ventilation -perfusion ratio. • Regulation of respiration during exercise. 	<p>L=12 T=14 P=8 IT=01</p>

Renal Physiology

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> • describe the structure & function of nephron. • describe the mechanism of urine formation. GFR, tubular reabsorption, tubular secretion. • describe the mechanism of water balance and osmotic diuresis. • explain physiological mechanism of micturition. 	<p>CORE:</p> <ul style="list-style-type: none"> • Kidney: functions • Nephron: types, parts, structure & functions • Renal circulation: peculiarities & functional importance • Urine formation: basic mechanism • GFR: definition, determinants, control of GFR & regulation of renal blood flow • Reabsorption and secretion by the renal tubules • Definition of T_m, Renal threshold, tubular load & plasma load and diuresis. • Mechanism of formation of concentrated urine & diluted urine. • Micturition reflex <p>Additional /Applied Physiology Abnormalities of micturition</p>	<p>L= 12</p> <p>T= 10</p> <p>P= 02</p> <p>IT= 01</p>

Gastrointestinal Physiology

Learning Objectives	Contents	Hours / days
<p>Gastrointestinal Physiology</p> <p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> • describe the general principles of gastrointestinal function. • describe the movements of GIT 	<p>CORE:</p> <ul style="list-style-type: none"> • Physiological anatomy of gastrointestinal (GI) tract. • Enteric nervous system. • Local hormones of GIT: name, function & regulation of secretion • Hormonal control of GI function. • Movements of the GIT. • GI reflexes. <p>Additional / Applied Physiology</p> <ul style="list-style-type: none"> • Peptic ulcer diseases • Diarrhoea • Vomiting 	<p>L=10 T=8 P=02 IT=01</p>

Endocrine Physiology and Physiology of Reproduction

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> • describe types, hormonal receptors & general mechanism of action of hormone. • describe functions, mechanism of action & regulation of secretion of individual hormone. • describe disorders in relation to: <ul style="list-style-type: none"> • pituitary gland • thyroid and parathyroid gland • adrenal gland • endocrine pancreas 	<p>CORE :</p> <ul style="list-style-type: none"> • Endocrine glands : name & name of their hormones. • Hormone: definition, classification, mechanism of action, assessment of hormone level. • Hypothalamic hormones, releasing & inhibitory hormones: name and functions. • Pituitary Gland: physiological anatomy. • Pituitary hormones (anterior & posterior): name, functions, mechanism of action and their control by the hypothalamus and disorders (dwarfism, gigantism, acromegaly & hypopituitarism and diabetes insipidus). • Thyroid Gland: physiological anatomy. • Thyroid hormones: biosynthesis, transport, functions, mechanism of action, regulation of secretion, disorders (hypo and hyperthyroidism, cretinism, myxoedema and goitre).. • Parathyroid Gland: physiological anatomy. • Parathyroid hormone: functions, mechanism of action & regulation of secretion. • Adrenal Gland: physiological anatomy. Adrenocortical hormones: name, functions, mechanism of action, regulation of secretion & disorders (Addison's disease, Cushing's Syndrome, Conn's disease). • Islets of Langerhan's of pancreas - hormones: functions, mechanism of action & regulation of secretion & disorders 	<p>L=20 T=20 P=02 IT=01</p>

Learning Objectives	Contents	Hours / days
<p>Physiology of Reproduction</p> <p>At the end of the course the students will be able to :</p> <ul style="list-style-type: none"> • describe male & female reproductive organs & their hormones • describe spermatogenesis • explain about functions of testosterone, oestrogen and progesterone • describe ovulation, ovarian & menstrual cycle • demonstrate knowledge about puberty • demonstrate knowledge about contraception • describe physiology of pregnancy • explain about lactation 	<ul style="list-style-type: none"> • Introduction to reproductive physiology, sex determination & sex differentiation. Puberty • Functional anatomy of male reproductive system • Secondary sex characteristics of male • Testes: functional structure and functions • Testosterone: function. • Spermatogenesis: steps & hormonal control. • Functional anatomy of female reproductive system • Secondary sex characteristics of female • Ovaries : functional structure and functions. Functional structure of uterus. • Menstrual cycle: definition, phases and hormonal control. • Ovarian cycle: phases and hormonal regulation. • Ovulation: definition, mechanism & hormonal control. Indicators of ovulation. • Definition of menstruation, menarche & menopause. • Ovarian hormones • Functions of oestrogen and progesterone. • Placental hormones: name & functions. • Mammogenesis: development and lactation. <p>Additional/Applied Physiology Physiology of pregnancy Contraception</p>	

Neurophysiology

Learning Objectives	Contents	Hours / days
<p>At the end of the course the</p> <p>Students will be able to:</p> <ul style="list-style-type: none"> • explain organization of the nervous system • explain the basic mechanism of synaptic transmission. • describe the sensory system of the body. • describe the organization and functions of the spinal cord. • explain the cord reflexes. • describe the motor control system- pyramidal and extra pyramidal systems. • describe the functions of cerebellum. • describe functions of basal ganglia, thalamus, reticular formation & limbic system • describe functions of CSF and Blood brain barrier. • describe functions of hypothalamus • describe organization & function of autonomic nervous system 	<p>CORE:</p> <ul style="list-style-type: none"> • Functional organization of nervous system and functions of major levels of central nervous system(CNS). • Neuron: definition, parts, types • Nerve fiber: classification, properties, effects of injury/section to the nerve fiber • Synapse: physiological anatomy, properties, types, synaptic transmission • Neurotransmitters: definition, types, functions • Sensory receptor: definition, classification, properties, receptor potential. • General/somatic senses: definition, classification • Ascending tracts/sensory pathways: name & function. • Spinothalamic tract, tract of Gall, tract of Burdach, spinocerebellar tract : origin, course, termination & function. • Cerebral cortex: name & functions of the Brodmann's areas • Reflex: definition, classification, properties, • Reflex arc: definition, components • Stretch reflex, withdrawal reflex, crossed extensor reflex, reciprocal innervation & planter response. • Muscle spindle: definition, physiological anatomy, functions. • Muscle tone: definition, function, maintenance • Descending tracts / motor pathways: name & function. • Pyramidal tract: origin, course, termination, function & effect of lesion. • Extraparamidal tract: name, functions. • Upper motor neuron and Lower motor neuron: definition, example, effect of lesion. • Spinal cord: hemisection. 	<p>L=18 T=18 P=08 IT=01</p>

Learning Objectives	Contents	Hours / days
	<ul style="list-style-type: none"> • Cerebellum: functional division, functions, error control mechanism of motor activity & cerebellar disorder. • Basal ganglia: functional components, functions & effects of lesion • Thalamus, Reticular formation, limbic system: components & functions. • CSF: Circulation, functions • Blood brain barrier: function • Hypothalamus: name of the nucleus and functions • Autonomic Nervous system: components and functions <p>Additional/Applied Physiology Pain: types, dual pathway for transmission of pain, referred Pain Spinal cord transection. Posture, equilibrium: definition, name of the areas controlling them. Sleep, memory: definition, name of the areas controlling them. Alarm or stress response</p>	

Physiology of Body Temperature

Learning Objectives	Contents	Hours / days
<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> describe the physiology & regulation of body temperature. 	<p>CORE :</p> <ul style="list-style-type: none"> Normal body temperature, site of measurement, sources of heat gain, channels of heat loss, regulation of body temperature in hot and cold environment. <p>Additional/Applied Physiology Heat stroke, hypothermia, frost bite, fever.</p>	<p>L=02 T=02 P=02</p>
Physiology of Special Senses		
<p>At the end of the course the students will be able to:</p> <ul style="list-style-type: none"> describe the neurophysiology of vision and visual pathway explain errors of refraction, accommodation reaction, light reflexes, dark and light adaptation. explain mechanism of hearing and describe auditory pathway describe the physiology of smell and taste 	<p>CORE:</p> <ul style="list-style-type: none"> Vision : physiological anatomy of eye, image formation in the eyes, visual receptors, visual pathway, common refractive errors, photochemistry of vision, accommodation reaction, light reflex, dark & light adaptation, Field of vision, color vision, color blindness, visual acuity. Hearing: auditory apparatus, receptor, mechanism of sound wave transmission, auditory pathway. Smell: smell receptors, olfactory pathway. Taste: taste receptors, modalities of taste sensation, taste pathway. <p>Additional/Applied Physiology Effects of lesion in visual pathway Visual acuity</p>	<p>L=08 T=08 P=08 IT=01</p>

Physiology Practical

Learning Objectives	Contents	Hours / days
<p>Cellular Physiology & Physiology of Blood</p> <p>Students will be able to</p> <ul style="list-style-type: none"> • demonstrate knowledge on common laboratory equipments used for practical hematology. • perform common hematological tests. • interpret results for practical purpose. 	<p>CORE:</p> <ul style="list-style-type: none"> • Developing skill in using of microscope & common laboratory equipments. • Collection & preparation of blood sample. • Observation of osmotic behavior of RBC • Determination of total count of RBC, • Determination of total count of WBC • Determination of differential count of WBC. • Estimation of haemoglobin. • Observation of osmotic fragility of RBC. • Determination of ESR • Determination of PCV. • Determination of Blood grouping (ABO & Rh system) & cross matching. • Determination of bleeding time & clotting time. • Interpretation of Red Cell Indices 	<p>02</p> <p>48</p>
<p>Cardiovascular Physiology</p> <p>Students will be able to :</p> <ul style="list-style-type: none"> • examine the radial pulse & its application. • measure the blood pressure and effect of exercise on it. • auscultate 1st & 2nd heart sounds. • record & analysis of normal ECG. • interpret the effect of drug and temperature on frog's heart. 	<p>CORE :</p> <ul style="list-style-type: none"> • Measurement of Blood Pressure & effect of exercise on it. • Auscultation of 1st & 2nd heart sounds. • Examination of radial pulse. • Recording & analysis of normal ECG (12 leads). <p>Additional/Applied Physiology Interpretation of effect of worm and cold application on frog's heart (tracing provided). Interpretation of effect of drugs on frogs heart (tracing provided).</p>	<p>18</p>

Learning Objectives	Contents	Hours / days
Respiratory Physiology Students will be able to : <ul style="list-style-type: none"> • examine the Respiratory system • perform lung function tests & interpret tests on clinical conditions. • demonstrate the knowledge about breath sounds. 	CORE: <ul style="list-style-type: none"> • Examination of respiratory system (physiological aspect) • Counting of respiratory rate. • Auscultation of breath sounds. • Determination of lung function tests including Spirometry. • Determination of kymographic recording of respiratory movements & effect of breath holding, hyperventilation, speech, deglutition (tracing provided.) 	08
Gastrointestinal Physiology Students will be able to: <ul style="list-style-type: none"> • auscultate the intestinal sound 	CORE <ul style="list-style-type: none"> • Auscultation of intestinal sound 	02
Renal Physiology Students will be able to: <ul style="list-style-type: none"> • Determine the specific gravity of urine 	CORE <ul style="list-style-type: none"> • Determination of specific gravity of urine 	02
Neurophysiology Students will be able to : <ul style="list-style-type: none"> • examine the sensory & motor functions of human body. • elicit the reflexes & interpret its clinical importance. 	CORE : <ul style="list-style-type: none"> • Examination of motor & sensory functions. • Elicitation of the reflexes & interpretation of its clinical importance. (knee jerk, biceps jerk, triceps jerks & planter response). 	10
Physiology of Body Temperature Students will be able to <ul style="list-style-type: none"> • record the body temperature 	CORE: <ul style="list-style-type: none"> • Recording of the body temperature. • Observation of the effect of exercise on body temperature. 	02
Physiology of Special senses Students will be able to : <ul style="list-style-type: none"> • perform the light reflex & accommodation reaction • perform visual acuity & color vision. • conduct tests for hearing & interpret the result 	CORE: <ul style="list-style-type: none"> • Observation of Light reflex, • Interpretation of visual acuity, color vision & Perimetry. • Conduction and interpretation of Rinne test & Weber test. 	08

Distribution of Teaching Hours

Systems	Lecture hours	Tutorial hours	Practical hours	Integrated teaching hours
1. Cellular Physiology	5	6	2	1
2. Physiology of blood	15	16	48	1
3. Cardiovascular Physiology	18	18	18	2
4. Respiratory Physiology	12	14	8	1
5. Gastrointestinal Physiology	10	8	2	1
6. Renal physiology	12	10	2	1
7. Endocrine Physiology & Physiology of Reproduction	20	20	2	1
8. Neurophysiology & Physiology of body temperature	20	20	10	1
9. Physiology of Special Senses	08	8	8	1
Total	120 (includes 2 hours IT)	120 (includes 2 hours IT)	100 (includes 2 hours IT)	10 (includes 2 hours IT)

Time allocation in Physiology in different term

Term	Lecture hours	Tutorial hours	Practical hours	Integrated teaching hours	Total hours
1st Term	38	40	38	03	116
2nd Term	34	32	32	04	98
3rd Term	48	48	30	03	126
Grand Total	120	120	100	10	340

Summative Assessment of Physiology (First Professional Examination)

Assessment systems and mark distribution

Components	Marks	Total Marks	Contents
WRITTEN EXAMINATION Paper – I- Formative Assessment + MCQ +SAQ Paper – II- Formative Assessment + MCQ +SAQ	10+20+70 = 100 10+20+70 =100	200	Paper – I 1. Cellular physiology 2. Physiology of blood 3. Cardiovascular physiology 4. Respiratory physiology 5. Gastrointestinal physiology Paper – II 1. Renal physiology 2. Endocrine physiology & physiology of Reproduction 3. Neurophysiology & temperature regulation 4. Physiology of Special senses
PRACTICAL EXAMINATION OSPE Traditional practical methods and experiments Practical Note Book	40 50 10	100	
ORAL EXAMINATION (Structured) 2 boards	Board – I = 50 Board – II = 50	100	
Grand Total		400	

Pass marks 60% in each of written, oral and practical.

Department of Physiology

Students In course Evaluation Card. (Card for card completion & Term final examination on Physiology for individual student)

Students name----- Roll no.-----
 Session ----- Year----- Batch-----
 Date of starting ----- Date of ending -----

Components	Written		Oral		Practical		Remarks (Signature & Date)
	Full Marks	Marks Obtained	Full Marks	Marks Obtained	Full Marks	Marks Obtained	
Cellular physiology & Physiology of Blood	100		100				
Cardiovascular physiology	100		100				
Respiratory physiology	100		100				
Gastrointestinal Physiology & Renal physiology	100		100				
Endocrine physiology	100		100				
Physiology of Reproduction	100		100				
Neurophysiology Physiology of Special Senses	100		100				
1 st Term	100		100		100		
2 nd Term	100		100		100		
3 rd Term	100		100		100		

Department of Physiology Attendance Record

Components	Total Class held	Total Class attended	Percentage (attended/ Held)	Remarks (Signature & Date)
Lecture (120 hours)				
Tutorial (120 hours)				
Practical (100 hours)				
Integrated teaching (10 hours)				

Academic Calendar for Physiology

		1 st Term		2 nd Term		3 rd Term	
Teaching /Learning Method	Teaching hours including Examination	20 Working weeks	E V A	20 Working weeks	E V A	18 Working weeks	E V A
Lecture	120 Hours	GP- 05 hours Blood—15 hours CVS—18 hours	L U A	Resp. Physiology—12 hours GIT—10 hours Renal- 12 hours.	L U A	Endocrine & Reproduction—20 hours Nervous system & Body temp.—20 hours. Special Senses-08 hours.	L U A T
Tutorial	120 hours	GP—06 <u>hours</u> . Blood –16 hours. CVS—18 hours.	T I O N	Respiration—14 hours. GIT—08 hours. Renal —10hours.	T I O N	Endocrine & reproduction—20 hours. Nervous system & Body temp. –20 hours Special Senses—08 hours.	I O N
Practical	100 hours.	GP—02 hours. Blood—36 hours.	4 W E E K S	Blood-- 12 hours CVS---18 hours. GIT—02 hours	4 W E E K S	Respiration- 08 hours Renal – 02 hours Endocrine—02 hours Neuro physiology -08 hours Body temp—02 hours Special Senses--08 hours	7 W E E K S

Continuous Assessment Card

Department of Physiology----- **Medical college**-----
Students name----- **Roll no.**-----
Session ----- **Year** ----- **Batch** -----
Date of starting ----- **Date of ending** -----

Card 1: (Cellular Physiology & Blood)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Definition, goal & importance of physiology. Homeostasis: definition, major functional systems, control systems of the body	10		
2.	The cell: functions of cell membrane & cell organelles.	10		
3.	The cell membrane transport: active & passive transport, exocytosis & endocytosis. Intercellular communications	10		
4.	Membrane potential: definition and basic physics of membrane potential. Resting membrane potential Nerve Action potential & propagation of action potential.	10		
5.	Neuromuscular junction, muscle contraction & transmission of impulse from nerve ending to the muscle fibre.	10		
6.	Composition & functions of blood, Plasma proteins: Origin, normal values, properties & functions.	10		
7.	RBC: normal count, morphology, functions, erythropoiesis, fate of RBC. Hemoglobin: synthesis, types, functions. Red blood cell indices. Anaemia: definition & classification Polycythemia: definition & type. Jaundice: definition & classification	10		
8.	WBC: classification with normal count, morphology, development, properties & functions. leucocytosis, leucopenia .	10		
9.	Platelets: normal count, morphology, functions & development. Hemostasis: definition & events Coagulation: definition, blood clotting factors . Mechanism of coagulation & fibrinolysis. Anticoagulant: name, mode of action. Bleeding disorder: thrombocytopenic purpura & hemophilia. Tests for bleeding disorder: bleeding time, coagulation time and prothrombin time.	10		
10.	Blood grouping: ABO & Rh system, hazards of blood transfusion & Rh incompatibility.	10		

Signature of batch teacher :

Signature of head of department :

Continuous Assessment Card

Department of Physiology----- **Medical college**-----
Students name----- **Roll no.**-----
Session ----- **Year** ----- **Batch** -----
Date of starting ----- **Date of ending** -----

Card 2: (Cardiovascular Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Properties of cardiac muscle. Junctional tissues of the heart. Generation of cardiac impulse & its conduction in the heart.	10		
2.	Cardiac cycle: definition, events, pressure & volume changes during different phases of cardiac cycle. Heart sounds : type, characteristics and their significances ECG : definition, principles and interpretations	10		
3.	Functional classification of blood vessels, interrelationship among pressure, flow & resistance. Local & humoral control of blood flow in the tissues. Exchange of fluid through the capillary membrane.	10		
4.	SV, EDV, ESV: definition & factors affecting them. Cardiac output : definition, measurement, regulation and factors affecting cardiac output. Venous return: definition & factors affecting. Heart rate: factors affecting & regulation. Pulse: definition, characteristics	10		
5.	Peripheral resistance: definition & factors affecting. Blood pressure: definition, types, measurement & regulation of arterial blood pressure.	10		
6.	Circulatory adjustment during muscular exercise Cardiac arrhythmias : tachycardia, bradycardia. Heart block: definition and types Shock: definition, classification. Physiological basis of compensatory mechanism of circulatory shock.	10		

Signature of batch teacher :

Signature of head of department :

Continuous Assessment Card

Department of Physiology----- **Medical college**-----
Students name----- **Roll no.**-----
Session ----- **Year** ----- **Batch** -----
Date of starting ----- **Date of ending** -----

Card 3: (Respiratory Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (signature & Date)
1.	Respiration: definition, mechanism. Pulmonary & Alveolar ventilation. Pulmonary volumes and capacities(spirometry) Dead space: physiological & anatomical Lung function tests : name & significance	10		
2.	Composition of atmospheric, alveolar, inspired and expired air. Respiratory unit and respiratory membrane. Diffusion of Gases through the respiratory membrane. Peculiarities of pulmonary circulation Ventilation -perfusion ratio.	10		
3.	Transport of Oxygen & Carbon dioxide in blood. Oxy-hemoglobin dissociation curve. Bohr effect, Haldane effect & Chloride shift.	10		
4.	Respiratory centers: name, location & functions. Nervous & chemical regulation of respiration. Regulation of respiration during exercise.	10		
6.	Hypoxia: definition, types Cyanosis: definition & types. Definition of dyspnea, hypercapnea & periodic breathing.	10		

Signature of batch teacher :

Signature of head of department :

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Department of Physiology----- Medical college-----

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Date of starting ----- Date of ending -----

Card 4 : (Gastrointestinal Physiology & Renal physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks (Signature & Date)
1.	Physiological anatomy of gastrointestinal (GI) tract. Enteric nervous system. Local hormones of GIT: name, functions & regulation of secretion Neural and hormonal control of GI function.	10		
2.	Movements of the GIT. GI reflexes.	10		
3.	Kidney: functions of kidneys. Renal circulation: peculiarities with functional importance.	10		
4.	Urine formation Glomerular filtration, determinants of GFR, Autoregulation of renal blood flow and GFR.	10		
5.	Reabsorption and secretion by the renal tubules Definition of T_m , Renal threshold, tubular load & plasma load and diuresis	10		
6.	Mechanism of formation of concentrated & dilute urine.	10		
7.	Micturition reflex Abnormalities of micturition	10		

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Date of starting ----- **Date of ending** -----

Card 5 : (Endocrine Physiology)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks
1.	Endocrine glands: name Hormones: definition, classification, mechanism of action, regulation of secretion	10		
2.	Hypothalamic hormones. Pituitary hormones (anterior & posterior): name, functions and their control by the hypothalamus and disorders (Dwarfism, gigantism, acromegaly & hypopituitarism and diabetes insipidus)	10		
3.	Thyroid hormones: biosynthesis, transport, functions, regulation of secretion, disorders (Hypothyroidism hyperthyroidism, Cretinism, Myxoedema and goitre). .	10		
4.	Parathyroid hormone: functions, mechanism of action & regulation of secretion.	10		
5.	Adrenocortical hormones: name, functions , mechanism of action , regulation of secretion & disorders (Addison's disease, Cushing's Syndrome, Conn's disease).	10		
6.	Hormones of Islets of Langerhan's of pancreas: functions , mechanism of action, regulation of secretion & disorders	10		

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Date of starting ----- **Date of ending** -----

Card 6: (Physiology of Reproduction)

Sl. No.	Name of item	Full Marks	Marks Obtained	Remarks
1.	Introduction to reproductive physiology, sex determination & sex differentiation. Puberty Functional anatomy of male reproductive system. Secondary sex characteristics of male Gonad : functional structure and functions of testes. Testosterone: functions, Spermatogenesis: steps & hormonal control.	10		
2.	Functional anatomy of female reproductive system. Secondary sex characteristics of female Gonad : functional structure and functions of ovaries. Functional structure of uterus Menstrual cycle: definition, hormonal control Ovarian and endometrial cycle with their hormonal regulation. Ovulation: definition, mechanism & hormonal control. Indicators of ovulation Definition of menstruation, menarche & menopause. Ovarian hormones Oestrogen and progesterone: functions	10		
3.	Physiology of pregnancy & Lactation: Pregnancy: physiological changes during pregnancy. Placental hormones: name & functions. Mammogenesis: hormonal influence for mammogenesis & lactation Physiology of contraception	10		

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Card 7: (Neurophysiology & special senses)

Sl. No	Name of item	Full Marks	Marks Obtained	Remarks & signature
1.	Functional organization and functions of major levels of central nervous system(CNS). Neuron: definition, parts, types Nerve fiber: classification, properties, effects of injury to the nerve fiber Synapse: physiological anatomy, type, properties & synaptic transmission Neurotransmitters: definition, types & functions	10		
2.	Sensory systems of the body: Sensory receptor: definition, classification, properties, receptor/generator potential. Cerebral cortex : Name and functions of the Brodmann's areas. General/somatic senses: definition and classification. Ascending tracts/sensory pathways – name.(Tract of Gall & Burdach, spinothalamic tract, spinocerebellar tract): origin, course, termination, functions, and effect of lesions.	10		
3.	Reflex: definition, classification, properties. Reflex arc: definition, component stretch reflex, knee jerk, planter response and Withdrawal reflex- with reciprocal innervations & crossed extensor-pathway . Muscle spindle, Golgi tendon organ: definition, physiological anatomy and functions. Muscle tone : definition , function and maintenance.	10		
4.	Descending tracts/ motor pathways- name Pyramidal tract: origin, course, termination, function, effect of lesion. Extrapyramidal tract: name, functions. Upper motor neuron and lower motor neuron : definition, effect of lesion. Spinal cord : effect of hemisection.	10		
5.	Cerebellum: functional division, neuronal circuit, functions, error control mechanism of motor activity & cerebellar disorder,	10		
6.	Basal ganglia: functional components, functions & effects of lesions. Thalamus, Reticular formation, Limbic system: functional components and functions. CSF: circulation & functions. Blood brain barrier: function.	10		
8.	Hypothalamus: name of the nucleus, functions Body Temperature Normal body temperature, site of measurement, sources of heat gain, channels of heat loss, regulation of body temperature in hot and cold environment.	10		
9.	Autonomic Nervous system: physiological anatomy of sympathetic and parasympathetic system, functions. Alarm or stress response	10		
10.	Vision: physiological anatomy of eye, image formation in the eyes, visual receptors, visual pathway, common refractive errors, accommodation reaction, light reflex, dark and light adaptation. Field of vision, color vision, visual acuity	10		
11.	Hearing: auditory apparatus, receptor, Mechanism of hearing, mechanism of sound transmission and auditory pathway.	10		
12.	Smell: receptor and pathway. Taste: receptors, modalities of taste sensation and pathway.	10		

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Card 8: Physiology Practical

(I hear and I forget, I see and I remember, I do and I understand)

SL NO	Name of experiment	Full Marks	Marks obtained
1	laboratory equipment. laboratory animals, blood sample, collection (venous & capillary) of blood.	10	
2	Preparation & staining of blood film & differential count of WBC with interpretation and analysis of result	10	
3	Determination of total count of WBC with interpretation and analysis of result	10	
4	Determination of total count of RBC with interpretation and analysis of result	10	
5	Estimation of haemoglobin with interpretation and analysis of result	10	
6	Determination of packed cell volume (PCV), Calculation of MCV, MCH & MCHC with interpretation and analysis of result	10	
7	Estimation of ESR by Westergren method with interpretation and analysis of result	10	
8	Determination of bleeding time, clotting time with interpretation and analysis of result	10	
9	Study of morphology and osmotic behavior of RBC with interpretation and analysis of result	10	
10	Determination of ABO & Rh blood groups with interpretation and analysis of result	10	
11	Auscultation of 1 st & 2 nd heart sounds	10	
12	Clinical examination of radial pulse.	10	
13	Measurement of normal blood pressure & effects of exercise on blood pressure.	10	
14	Recording & analysis of 12 leads normal ECG	10	
15	Auscultation of breath sounds	10	
16	Spirometric measurement of lung function test. Determination of FVC, FEV ₁ , FEV ₁ /FVC %, PEFR, MVV with analysis of result.	10	
17	Study on the tracing of respiratory movements & effects of breath holding, hyperventilation, speech, deglutition (physiological apnoea) .	10	
18	Auscultation of intestinal sound.	10	

19	Elicitation of knee jerk, planter response	10	
20	Recording of oral & axillary temperature & effects of exercise on it	10	
21	Mapping of visual field by perimeter	10	
22	Observation of light reflexes and analysis of result	10	
23	Determination of color vision	10	
24	Determination of visual acuity by Snellen's chart.	10	
25	Determination of hearing tests: Rinne and Weber test with interpretation and analysis of result	10	
26.	Determination of specific gravity of urine	10	
27.	Demonstration of uses of computer and other IT materials (One observer station should remain in 1 st professional MBBS examination in the physiology discipline)	10	

Signature of batch teacher:

Signature of head of the department:

Integrated Teaching in Physiology

Integrated teaching program on a particular topic/organ /organ system should be organized in each term. The topics which are related should be prepared after discussion with the teachers of Anatomy/Physiology/Biochemistry. The horizontal process of Integrated teaching program will help the students to have a simultaneous views of different aspects of Anatomical/Physiological/Biochemical details of a particular topic/organ /organ system.

TOPICS	LEARNING OBJECTIVES	TERM	DEPARTMENT
1. Cell	Students will be able to <ul style="list-style-type: none"> • describe the structure & functions of different constituents of cell • explain membrane transport, membrane potentials & action potentials • state the composition of ECF & ICF compartments 	I	Anatomy Physiology Biochemistry
2.Heart	Students will be able to <ul style="list-style-type: none"> • describe the gross anatomy & clinical anatomy of heart • describe the types & regulation of blood pressure • describe the physiologic basis of shock management • describe & interpret the cardiac markers 	I	Anatomy Physiology Biochemistry
3.Lung	Students will be able to describe <ul style="list-style-type: none"> • the gross anatomy & clinical anatomy of lungs • the spirometry & its clinical application • the regulation of respiration 	I	Anatomy Physiology Biochemistry
4. Hepatobiliary system	Students will be able to <ul style="list-style-type: none"> • describe the gross anatomy & clinical anatomy of hepato-biliary system • interpret the liver function test & explain its clinical importance • explain the role of liver in metabolism 	II	Anatomy Physiology Biochemistry
5.Kidney	Students will be able to <ul style="list-style-type: none"> • describe the gross anatomy & clinical anatomy of kidney • explain the mechanism of urine formation • interpret kidney function test • explain the renal chemistry in relation to water, electrolytes & acid base balance 	II	Anatomy Physiology Biochemistry
6.Pancreas	Students will be able to <ul style="list-style-type: none"> • describe the gross anatomy & clinical anatomy of pancreas • hormones of islets of Langerhan's of pancreas • functions ,mechanism of action & regulations of secretion of insulin • causes & consequences of hyper & hypoglycaemia • laboratory diagnosis of diabetes mellitus 	II	Anatomy Physiology Biochemistry

TOPICS	LEARNING OBJECTIVES	TERM	DEPARTMENT
7. Adrenal gland	Students will be able to describe <ul style="list-style-type: none"> the gross anatomy & clinical anatomy of adrenal gland the functions, mechanism of action & regulation of secretion of adrenal hormones hypo & hyperadrenalism 	III	Anatomy Physiology Biochemistry
8. Thyroid & Parathyroid gland	Students will be able to describe <ul style="list-style-type: none"> the gross anatomy & clinical anatomy of thyroid & parathyroid gland the hormones of thyroid & parathyroid gland : biosynthesis, transport functions, mechanism of action & regulation of secretion hypo & hyperthyroidism tetany Thyroid function tests & their interpretation 	III	Anatomy Physiology Biochemistry
9. Pituitary gland	Students will be able to describe <ul style="list-style-type: none"> the gross anatomy & clinical anatomy of pituitary gland hormones of pituitary gland : functions, mechanism of action & regulation of secretion hypo & hyperpituitarism 	III	Anatomy Physiology Biochemistry
10. Sensory system & Motor system	Students will be able to describe <ul style="list-style-type: none"> receptors, synapse & sensory pathways the pyramidal system, extrapyramidal system cerebellum, basal nuclei & their disorder the different types of neurotransmitter & their functions 	III	Anatomy Physiology Biochemistry
11. Information Technology (IT)	Students will be able to describe, demonstrate and uses of - <ul style="list-style-type: none"> IT materials World wide web (www) Email and Email address MS word, MS excel, MS power point etc 	III	11 Departments Anatomy Physiology Biochemistry Community Medicine Pathology Microbiology Forensic Medicine Pharmacology Medicine Surgery Gynecology & Obstetrics