

BDS First Year Physiology Study Guide

Introduction:

Physiology is one of the essential basic science disciplines which dental students across Pakistan and outside study This discipline helps students learn about the functions of various systems of the body so that they are better able to understand the malfunctions at a later stage.

Outcomes:

By the end of this course, students will be able to:

- 1. Explain the functions of physiological systems of human body and their interaction with yield integrated physiological responses.
- 2. Perform experiments related to various human body systems.
- 3. Apply scientific information with respect to personal health, clinical applications and research in human physiology.

Teaching and learning:

- 1. Flipped Classroom (FC)
- 2. Interactive lectures (IL)
- 3. Tutorials
 - a. Case based learning (CBL)
 - b. Small group discussions (SGD)

Assessment tools:

- 1. Multiple Choice Questions: (MCQs)
- One Correct Type
- One Best Type
- 2. Observed structured practical examination (OSPE)
- 3. Short essay questions (SEQ)
- 4. Short answer questions (SAQ)



s.n	Торіс	Course Objectives:	Teaching	Assessment
0.		By the end of the course, 1 st year students will be	method	Tool
		able to:		
1	Foundation	 Define the following terminologies: osmotic pressure tonicity bulk transport phagocytosis 	IL	MCQ
		 pinocytosis Discuss the importance of physiology in modern medicine Discuss the basic life processes and survival needs of the body Explain the principle of homeostasis as a central theme of physiology Discuss the negative and positive feedback systems Describe the body fluid compartments Discuss the importance of cell as the basic unit of life Describe the composition of cell membrane 	SGD IL SGD IL	SEQ MCQ SEQ MCQ
		 Explain the structures and functions of cell and all its components Discuss the types of membrane transport Compare the various types of solutions with regard to their tonicity 	SGD	SEQ
2	Nerve & Muscle	 Define the following terminologies: motor unit motor unit recruitment simple muscle twitch summation tetanization fatigue synapse Nernst potential power stroke List the sources of energy for muscle contraction and types of smooth muscles 	IL	MCQ



•	Discuss the distribution of ions across the plasma	SGD	SEQ
•	Discuss the resting potential and its importance		
•	Write the Nernst equation		
•	Describe the structures and functions of different		
	parts of a neuron	IL	МСО
•	Discuss the electrical and chemical synapses	FC	C C
•	Describe the initiation of action potential	FC	
•	Discuss the phases of action potential and its	IL	
	propagation in myelinated and non-myelinated nerve		
	fibers		
•	Explain the graph of action potential		
•	Describe the structure and functional characteristics	SGD	SEQ
	of skeletal muscle		
•	Explain the role of actin and myosin in skeletal		
	muscle contraction		
•	Discuss the parts of neuromuscular junction (NMJ)		
•	Discuss the steps of impulse transmission through		
	neuromuscular junction		
•	Discuss the physiological basis of disorders of NMJ		
•	Discuss mechanism of skeletal muscle contraction		
	and relaxation at molecular level		
•	Describe the role of ATP in muscle contraction	IL	MCQ
•	Explain the phenomenon of excitation contraction		
	coupling in skeletal muscle		
•	Describe structure and function of sarcoplasmic		
	reticulum and 1-tubules		
•	Differentiate between isotonic and isometric muscle		
	Discuss the basis of muscle fatigue	aan	
	Differentiate among the different types of muscle	SGD	SAQ
	fibers on the basis of their structures and functions		
	Discuss the membrane and action potentials in		
	smooth muscles		
•	Discuss the contractile mechanism of smooth		
	muscles		
	Discuss the nervous and hormonal controls of		
	smooth muscle contraction		
•	Compare smooth and skeletal muscles with regard to	IL	MCQ



		their structures and functions		
3	Blood	 Define hemostasis, anemia and polycythemia List the sites of erythropoiesis List the contents and functions of platelets Classify anemia on the basis of cell morphology and etiology Describe the functions of blood and those of its components Describe the structure and functions of erythrocytes 	IL	MCQ
		 Draw a flow chart of RBCs production Discuss the humoral, maturational and nutritional factors affecting erythropoiesis Discuss the formation, functions, fate and pathologies of hemoglobin Discuss various types of polycythemia 	SGD	SEQ
		 Explain the following: ABO blood types Rh blood types Mismatched blood transfusion hazards 	CBL	SAQ
		 Erythroblastosisfetalis Discuss the events of hemostasis Discuss the intrinsic and extrinsic coagulation pathways Discuss the fibrinolytic mechanism Describe the factors that prevent clotting in normal vascular system Discuss the conditions that cause uncontrolled bleeding Discuss leukopoeisis and inflammation 	IL	MCQ
		 Discuss leukopoeisis and inflammation Differentiate among the various types of white blood cells on the basis of their functions and physical characteristics 	IL	МСQ
		 Describe immunity and its types Discuss types and functions of T-lymphocytes Discuss the structures of antigens and antibodies Discuss the complement system Describe hypersensitivity reactions 	SGD CBL	SEQ



4	Cardiovascular	• Discuss the physiology of cardiac muscle	FC	MCQ
	System	• Discuss the importance of intercalated discs in cardiac muscle function	SGD	
		• Compare various types of muscles with regard to		
		their structure and functions		
		• Discuss the structure of cardiac muscle with regard		
		to its function		
		• Discuss the cardiac action potential		
		• Compare the skeletal muscle and heart on the basis		
		of their action potentials		
		• Discuss the electrical conduction system of the heart		
		and the role of SA node		
		• Draw electrocardiogram (ECG) of a normally		
		functioning heart		
		• Discuss the following:		
		• Myocardial events		
		• 12 ECG leads		
		• Tachycardia		
		• Bradycardia		
		• Myocardial infarction/ischemia		
		• Atrial flutter		
		• Atrial fibriliation		
		• Heart blocks	п	
		• Define the cardiac vector and axis of neart	112	
		• Discuss the cardiac cycle	SGD	SEQ
		• Discuss cardiac output and Frank-Starling Law		
		• Discuss the nervous and chemical factors that alter		
		heart rate, stroke volume and cardiac output		
		• Discuss the physical characteristics of circulation		
		• Discuss the interrelationships of pressure, blood		
		flow and resistance		
		• Discuss vascular distensibility and functions of the		
		arterial and venous systems		
		• Discuss the systolic, diastolic, mean arterial and		
		pulse pressures		
		• Discuss short-, intermediate- and long-term	IL	
		regulations of blood pressure	SCD	
		• Discuss the renin angiotensin aldosterone system	SGD	MCQ
		• Describe the local control of blood flow		



		• Discuss the humoral control of circulation		SEQ
		• Explain the capillary system		_
		• Discuss the vasomotion and fluid-filtration across capillaries		
		• Describe the physiological causes of shock	IL	MCQ
5	Respiratory System	 List the structures that make up the respiratory system in correct order Discuss the functions of each structure of the respiratory system 	IL	МСQ
		 Differentiate between the conducting and respiratory zones of respiratory passages Describe the roles of muscles of respiration in breathing 	SGD	SEQ
		 Discuss the pressure gradients Discuss the significance of dead space Discuss the Boyle's Law 	IL	MCQ
		 Describe lung volumes and capacities in adult male Discuss the relationship of partial pressure with that of a gas mixture 	SGD	SEQ
		• Describe partial pressures of oxygen and carbon dioxide in venous and arterial blood, and alveolar air and cells	IL	MCQ
		• Discuss factors affecting exchange through the respiratory membrane		
		 Compare inspired and alveolar air with regard to their composition 	FC	MCQ
		 Discuss the role of partial pressure in gas transport by blood Describe the transport of oxygen and carbon dioxide 	IL SGD	SEQ
		Describe the transport of oxygen and carbon dioxide in bloodDiscuss the role of hemoglobin in oxygen transport	IL	MCQ
		• Describe the factors affecting release and binding of oxygen to hemoglobin		
		Discuss Bohr's and Haldane effectsInterpret the oxygen hemoglobin dissociation curve	SGD	SEQ
		graph	IL .	MCQ
		• Describe the role of the four main groups of nuclei	SGD	SEQ



		 that control breathing Discuss the factors that can influence rate and depth of breathing Describe locations of chemoreceptors that monitor blood pH and gas concentrations Discuss the role of chemoreceptors in the regulation of respiration Discuss the causes of the following respiratory disorders/conditions: Emphysema Bronchitis Asthma Pulmonary edema Hypoxia 	IL	MCQ
6	Nervous System	 List the different types of sensory pathways Describe the basic organization of the nervous system Discuss the generation of action potential and transmission of nerve signal Discuss synapse and its properties Discuss transmission of electrical signals between neurons Describe the general characteristics of receptors Classify receptors according to location and stimulus type Discuss receptor potential Discuss the transduction of sonsery stimuli into 	IL FC IL SGD IL	MCQ SEQ MCQ
		 Discuss the transduction of sensory stimuli into nerve impulses Discuss the transmission of sensory information into CNS (DCML and anterolateral) Discuss the various types of pain and pain receptors Discuss dual pathways for transmission of pain signals into CNS Discuss analgesia system in the brain and spinal cord Describe the brain opioids system Discuss the organization of the spinal cord for motor 	SGD	SAQ



		functions	IL	MCQ
		• Describe the role of muscle spindles and golgi tendon organs in muscle control	SGD	SAQ
		Discuss cord reflexes	IL	MCQ
		• Describe the pathway of pyramidal efferent tracts		
		• Compare pyramidal and extra pyramidal tracts with		
		regard to their origin, termination and function		
		• Discuss the major functions of the mid brain, pons and medulla oblongata		
		• Discuss the structure, functions, input and output		
		connections of cerebellum		
		• Describe various cerebellar disorders	CBI	540
		• Discuss the structure, functions, pathways and related disorders of basal ganglia	CBL	SAQ
		 Discuss the components of the limbic system and 	SCD	SFO
		their functions	560	SEQ
		Discuss the general organization and activation of ANS		
		• Discuss the structures and functions of sympathetic,		
		parasympathetic nervous system and adrenal		
		medulla		
		• Compare the divisions of the ANS with regard to the origin of preganglionic fibers, location of ganglia		
		and neurotransmitter substances		
		• Discuss the value of adrenal medullae in the function of the sympathetic nervous system		
7	Special Senses	• Describe the physiological functions of each part of	II.	МСО
,	Special Sellises	the eye		
		• Mention the refractory surfaces of eye and the		
		various errors of refraction and their corrections		
		• Explain the accommodation reflex		
		• Discuss the structure of retina and the fluid system of the eye	SGD	SAQ
		• Discuss the photochemistry of vision and image formation		
		 Discuss the visual pathway and associated lesions 		
		 Discuss the physiological anatomy of ear 		
		 Describe the role of ossicles in the process of 	π	MCO
		F		



		r			
			hearing		
		•	Discuss conductive and perceptive deafness		
		•	Describe the role of Auditory Pathway in hearing		
		٠	Discuss the role of vestibular apparatus in		
			monitoring equilibrium		
		٠	Discuss the various types of taste sensations and		
			their perceptions on the tongue		
		•	Describe location and activation of taste buds		
		•	Describe the gustatory pathway		
		٠	Describe the location and activation of the olfactory		
			receptors	FC	SEQ
		•	Discuss the primary sensations of smell	IL	мсо
		•	Describe the olfactory pathway		
		٠	Define the anosmia, hyposmia and dysosmia		
Ø	Endoarina System		List the major or domine alor do and their locations	TT	MCO
0	Endocrine System	•	Classifier harmonic	11.	MCQ
		•	Classify normones	SGD	SAQ
		•	Discuss the secretion, transport, clearance and		
			mechanisms of action of various normones		
		•	Describe the normone receptors and their activation	IL	
		•	Differentiate between endocrine and exocrine glands		
		•	Describe the structural and functional relationships	CDI	GEO
			of the hypothalamus-pituitary unit	CBL	SEQ
		•	Discuss the control, sites of action and functions of		
			the adenohypophysis hormones		
		•	Discuss the effects of hypo- and hyper-secretions of		
			adenonypophysis normones	IL	MCQ
		•	Compare the functions of the neurohypophysis with	SGD	SAO
			nat of the hypothalamus	TT .	
		•	Discuss the synthesis, secretions and effects of	IL	MCQ
			amenor and posterior pluttary normones		
		•	Describe the formation, secretion, functions and		
			Discuss disorders of thems: 1 house and		
			Discuss disorders of inyrold normones		
			Discuss the mode of action of insulin release		
		•	Discuss the functions of insulin, glucagon,		
			somatostatin and pancreatic polypeptide	IĹ	MCQ
		•	List the normones that regulate the calcium and	CBL	SAQ
			pnosphate homeostasis		



		 Discuss the functions of parathyroid hormone, vitamin D and calcitonin Describe hypo- and hypercalcemia Describe the sites of formation, functions and control of secretion of mineralocorticoids and glucocorticoids Discuss Cushing syndrome and Cushing and Addison's Diseases 	IL CBL	MCQ SAQ
9	Digestive System	• Describe the structural and functional organizations of the digestive system	IL SGD	MCQ SAO
		• Discuss the physiological anatomy of the	п	MCO
		 Discuss the characteristic features of the smooth muscles of the GIT 		mey
		• Discuss the neural and hormonal control of the GIT (Enteric Nervous System)		
		• Describe the role of interstitial cells of Cajal in generation of basic electrical rhythm (BER) of the GIT	SGD	SAQ
		 Describe the types of GIT reflexes Relate the role of interstitial cells of Cajal with smooth muscle contractile activity 	IL	MCQ
		• Compare the effects of parasympathetic and sympathetic nervous activity in modulating GI activity		
		• Describe the composition and functions of saliva		
		 List the factors that increase salivary secretion Discuss the pervous regulation of salivary secretion 		
		 Discuss the nervous regulation of sanvary secretion Discuss the chewing and swallowing reflexes 	FC	MCQ
		• Describe the functions of lower esophageal sphincter	IL	
		• Discuss the mechanisms that prevent food from entering the nasal cavity and larynx during swallowing	SGD	SAQ
		 List the functions of stomach 	п	MCO
		• Describe the components of gastric juice and their		MCQ
		functions	SGD	SAQ
		• Discuss the phases of gastric secretory activity, gastric emptying and its regulation	IL	MCQ



	• Describe the types of movement in small intestine	SGD	SAQ
	• Discuss the inhibition of motility and secretion in		
	the stomach		
	• Discuss peristaltic rush and migrating motor		
	complex	IL	МСО
	• List structures that increase the absorptive surface		
	area of the small intestine		
	• Differentiate between segmentation and the		
	migrating motor complex of the small intestine	SCD	
	• Discuss the factors affecting the motility and	SGD	SAQ
	secretion of food in the stomach		
	• Discuss the glands of small intestine with regard to	п	MCO
	their secretions and functions	112	MCQ
	• Describe the functions of each enzyme of the		
	intestinal brush border		
	• Describe the absorption of each type of nutrients in		
	the small intestine	SGD	SEQ
	• Discuss the composition, formation, conduction and		
	functions of bile and bile salts		
	• Describe the functions and emptying of gallbladder	IL	MCQ
	 Describe the composition and functions of 		
	pancreatic secretion		
	• Explain the phases of pancreatic secretion		
	 Discuss the role of hormones in regulating 	SGD	SEQ
	nancreatic secretion	Π	MCO
	 Describe the structure functions and major types of 		MCQ
	movements of large intestine		
	 Discus the defecation reflex 	SGD	SAO
	 Discuss functions of internal and external anal 	~ ~ ~	~ €
	snhincters		
	 Discuss the secretion and role of the following GIT 		
	hormones.		
	• Cholecystokinin		
	\circ Secretin		
	o GIP		
	o Gastrin		
	• Gastrin Releasing Peptide		
	 Pancreatic Polypeptide 		
	• Somatostatin		
		1	



		 Vasoactive Intestinal Polypeptide 		
		o Motilin		
10	Urinary System	• Discuss the functional anatomy of kidney	SGD	SEQ
		• Define nephron and its types	IL	мсо
		• Describe various parts of a nephron		
		• Discuss the functions of kidney		
		Define GFR	SGD	SEQ
		• State the normal range of GFR		
		• Describe the glomerular filtration membrane and its		
		function	IL	MCQ
		• Discuss the forces that promote and oppose glomerular filtration	SGD	SEQ
		Calculate net filtration pressure		
		• Discuss the significance of auto-regulation of GFR	FC	мсо
		• Describe the regulation of glomerular filtration by		
		hormones and the nervous system		
		• Discuss the passive and active mechanisms of	SGD	SAQ
		transport for tubular reabsorption		
		• Discuss the reabsorption of fluid by peritubular capillaries		
		• Discuss tubular reabsorption and regulation along		
		different parts of a nephron		
		• Define tubular load and Tubular transport maximum	IL	MCQ
		 Discuss the tubular secretion processes in different 		
		parts of a nephron	CBL	SAQ
		• Discuss the osmotic gradient		
		• Discuss the counter current mechanism		
		• Discuss the renal mechanisms for excreting diluted urine		
		• Discuss the roles of anti-diuretic hormone and		
		osmoreceptors		
		• Discuss the role of bladder in accommodating a		
		wide range of urine volume	IL	MCQ
		• Describe the neural reflex pathway that regulates emptying of bladder		
		 Discuss the effect of following hormones on kidney: ADH 	CBL	SAQ



		• Aldosterone		
		• Angiotensin II		
		• ANP		
		0 PIH		
	PRACTICALS By the end of the confollowing practical	ourse in Physiology, students will be able to perform the 's:	Teaching method	Assessment Tool
1	Foundation	Osmotic Fragility	Lab Demo	OSPE
2	Blood	 Drawing Blood and blood Sampling, using a Microscope Hemoglobin Estimation, ESR, Preparation of blood smear, DLC, Neubauer's Chamber RBC Count PCV Clotting time Bleeding Time Blood Grouping 		
3	Locomotor System	 Using a Power lab Interpretation of Simple Muscle Twitch, Summation, Fatigue, Tetanization 	Lab Demo	OSPE
4	CVS	 Arterial pulse examination ECG Heart Sound Blood Pressure Refractory period 		
5	Respiratory System	Lung volume and Capacities,Spirometry		
6	Neurosciences	 Superficial Reflexes Deep Reflexes Cerebellar function test Cranial nerve Examination Body Temperature 		
7	Special senses	Visual Acuity,Perimetry		



	•	Tuning fork test	
	•	Taste and smell	

Reading Sources:

Text Books:

TEXTBOOK OF PHYSIOLOGY BY GUYTON AND HALL

Practical Lab:

Physiology Departmental Lab is a state of Art where we have latest equipment's to perform Physiology Practical's along with its demonstration.

Internet resources: With easy excess to digital library students will use internet resources with added time flexibility to enrich and update their knowledge and its application.

Library: It provides wealth of resources, space to study alone or in a group. It also provides world of books to discover and borrow.

Assessment Criteria:

Knowledge:

- MCQs (Multiple Choice Questions) are used to assess objectives covered in each module.
- A MCQ has a statement or clinical scenario followed by four options (likely answer).
- Students after reading the statement/scenario select ONE, the most appropriate response from the given list of options.
- Correct answer carries one mark, and incorrect 'zero mark'. There is no negative marking.
- Students mark their responses on an answer sheet provided by examination department.

Skills:

- OSPE: Objective Structured Practical Examination:
- Each student will be assessed on the same content and have same time to complete the task.
- Comprise of 12-25 stations.
- Each station may assess a practical tasks include practical skills and application of knowledge
- Stations are observed, interactive, application of knowledge based and rest.



- In Observed and Interactive Stations these will be assessed by internal or external examiners through structured viva or a task.
- Application of knowledge Stations: it will be static stations in which there will be pictures, clinical scenarios with related questions for students to answer on the provided answer copy.
- Rests: It is a station where there is no task given and in this time student can organize his/her thoughts.

AIDM Internal Assessment Policy

Students will be assessed to determine achievement of learning objectives through the following:

- Midterm Examination will be scheduled on completion of half of the course
- Mock Examination will be scheduled on completion of whole course
- The method of examination comprises theory exam which includes MCQs, and practical examination by OSPE (Objective Structured Practical Examination).
- Student's behaviors and attitudes will be observed during all academic activities.

Annual Examination:

- Marks of both internal assessments will constitute 20% weightage as per JSMU policy.
- University Annual examination will be based on MCQs and OSPE.

Attempts:

There are 2 attempts in the third professional examination only.2nd attempt is the supplementary examination which if not passed student has to repeat the year.

Course Evaluation:

- Pass/fail ratio of continuous and summative assessments will be evaluated.
- 75% attendance is mandatory to be eligible for annual professional examination
- Feedback will be taken
 - Regarding course from students and faculty
 - Student feedback regarding faculty
 - Faculty feedback of students



Course Faculty:

Professor & HoD Physiology: Dr. Sheema Farhan

Lecturers:

- Dr. Shirmeen Saleem
- Dr. Iman Nadeem
- Dr. Shehwar Jawed

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