



**ALTAMASH INSTITUTE OF DENTAL MEDICINE
(JINNAH SINDH MEDICAL UNIVERSITY)**

**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)



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s.n o.	Topic	Course Objectives: By the end of the course, 1 st year students will be able to:	Teaching method	Assessment Tool
1	Foundation	<ul style="list-style-type: none"> • Define the following terminologies: <ul style="list-style-type: none"> ○ osmotic pressure ○ tonicity ○ bulk transport ○ phagocytosis ○ 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 composition of body fluid compartments • Discuss the importance of cell as the basic unit of life • Describe the composition of cell membrane • 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 	<p>IL</p> <p>SGD</p> <p>IL</p> <p>SGD</p> <p>IL</p> <p>SGD</p>	<p>MCQ</p> <p>SEQ</p> <p>MCQ</p> <p>SEQ</p> <p>MCQ</p> <p>SEQ</p>
2	Nerve & Muscle	<ul style="list-style-type: none"> • Define the following terminologies: <ul style="list-style-type: none"> ○ 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



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	<ul style="list-style-type: none"> • Discuss the distribution of ions across the plasma • Discuss the resting potential and its importance • Write the Nernst equation • Describe the structures and functions of different parts of a neuron • Discuss the electrical and chemical synapses • Describe the initiation of action potential • Discuss the phases of action potential and its propagation in myelinated and non-myelinated nerve fibers • Explain the graph of action potential • Describe the structure and functional characteristics 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 • Explain the phenomenon of excitation contraction coupling in skeletal muscle • Describe structure and function of sarcoplasmic reticulum and T-tubules • Differentiate between isotonic and isometric muscle contraction • Discuss the basis of muscle fatigue • Differentiate among the different types of muscle 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 	<p>SGD</p> <p>IL</p> <p>FC</p> <p>IL</p> <p>SGD</p> <p>IL</p> <p>SGD</p> <p>IL</p>	<p>SEQ</p> <p>MCQ</p> <p>SEQ</p> <p>MCQ</p> <p>SAQ</p> <p>MCQ</p>
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		<ul style="list-style-type: none"> • Discuss the humoral control of circulation • Explain the capillary system • Discuss the vasomotion and fluid-filtration across capillaries • Describe the physiological causes of shock 	IL	SEQ MCQ
5	Respiratory System	<ul style="list-style-type: none"> • List the structures that make up the respiratory system in correct order • Discuss the functions of each structure of the respiratory system • Differentiate between the conducting and respiratory zones of respiratory passages • Describe the roles of muscles of respiration in breathing • Discuss the pressure gradients • Discuss the significance of dead space • Discuss the Boyle's Law • Describe lung volumes and capacities in adult male • Discuss the relationship of partial pressure with that of a gas mixture • Describe partial pressures of oxygen and carbon dioxide in venous and arterial blood, and alveolar air and cells • Discuss factors affecting exchange through the respiratory membrane • Compare inspired and alveolar air with regard to their composition • Discuss the role of partial pressure in gas transport by blood • Describe the transport of oxygen and carbon dioxide in blood • Discuss the role of hemoglobin in oxygen transport • Describe the factors affecting release and binding of oxygen to hemoglobin • Discuss Bohr's and Haldane effects • Interpret the oxygen hemoglobin dissociation curve graph • Describe the role of the four main groups of nuclei 	IL SGD IL SGD IL FC IL SGD IL SGD IL SGD	MCQ SEQ MCQ SEQ MCQ MCQ MCQ SEQ MCQ SEQ



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		<p>that control breathing</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> ○ Emphysema ○ Bronchitis ○ Asthma ○ Pneumonia ○ Pulmonary edema ○ Hypoxia 	IL	MCQ
6	Nervous System	<ul style="list-style-type: none"> • 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 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 	IL FC IL SGD IL SGD	MCQ SEQ MCQ SAQ



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		<p>hearing</p> <ul style="list-style-type: none"> • Discuss conductive and perceptive deafness • Describe the role of Auditory Pathway in hearing • Discuss the role of vestibular apparatus in monitoring equilibrium • Discuss the various types of taste sensations and their perceptions on the tongue • Describe location and activation of taste buds • Describe the gustatory pathway • Describe the location and activation of the olfactory receptors • Discuss the primary sensations of smell • Describe the olfactory pathway • Define the anosmia, hyposmia and dysosmia 	<p>FC</p> <p>IL</p>	<p>SEQ</p> <p>MCQ</p>
8	Endocrine System	<ul style="list-style-type: none"> • List the major endocrine glands and their locations • Classify hormones • Discuss the secretion, transport, clearance and mechanisms of action of various hormones • Describe the hormone receptors and their activation • Differentiate between endocrine and exocrine glands • Describe the structural and functional relationships of the hypothalamus-pituitary unit • Discuss the control, sites of action and functions of the adenohypophysis hormones • Discuss the effects of hypo- and hyper-secretions of adenohypophysis hormones • Compare the functions of the neurohypophysis with that of the hypothalamus • Discuss the synthesis, secretions and effects of anterior and posterior pituitary hormones • Describe the formation, secretion, functions and regulation of thyroid hormones • Discuss disorders of thyroid hormones • Discuss the mode of action of insulin release • Discuss the functions of insulin, glucagon, somatostatin and pancreatic polypeptide • List the hormones that regulate the calcium and phosphate homeostasis 	<p>IL</p> <p>SGD</p> <p>IL</p> <p>CBL</p> <p>IL</p> <p>SGD</p> <p>IL</p> <p>IL</p> <p>CBL</p>	<p>MCQ</p> <p>SAQ</p> <p>SEQ</p> <p>MCQ</p> <p>SAQ</p> <p>MCQ</p> <p>SAQ</p>



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	<ul style="list-style-type: none"> • Describe the types of movement in small intestine • Discuss the inhibition of motility and secretion in the stomach • Discuss peristaltic rush and migrating motor complex • List structures that increase the absorptive surface area of the small intestine • Differentiate between segmentation and the migrating motor complex of the small intestine • Discuss the factors affecting the motility and secretion of food in the stomach • Discuss the glands of small intestine with regard to their secretions and functions • Describe the functions of each enzyme of the intestinal brush border • Describe the absorption of each type of nutrients in the small intestine • Discuss the composition, formation, conduction and functions of bile and bile salts • Describe the functions and emptying of gallbladder • Describe the composition and functions of pancreatic secretion • Explain the phases of pancreatic secretion • Discuss the role of hormones in regulating pancreatic secretion • Describe the structure, functions and major types of movements of large intestine • Discuss the defecation reflex • Discuss functions of internal and external anal sphincters • Discuss the secretion and role of the following GIT hormones: <ul style="list-style-type: none"> ○ Cholecystokinin ○ Secretin ○ GIP ○ Gastrin ○ Gastrin Releasing Peptide ○ Pancreatic Polypeptide ○ Somatostatin 	<p style="text-align: center;">SGD</p> <p style="text-align: center;">IL</p> <p style="text-align: center;">SGD</p> <p style="text-align: center;">IL</p> <p style="text-align: center;">SGD</p> <p style="text-align: center;">IL</p> <p style="text-align: center;">SGD</p> <p style="text-align: center;">IL</p> <p style="text-align: center;">SGD</p>	<p style="text-align: center;">SAQ</p> <p style="text-align: center;">MCQ</p> <p style="text-align: center;">SAQ</p> <p style="text-align: center;">MCQ</p> <p style="text-align: center;">SEQ</p> <p style="text-align: center;">MCQ</p> <p style="text-align: center;">SEQ</p> <p style="text-align: center;">MCQ</p> <p style="text-align: center;">SAQ</p>
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		<ul style="list-style-type: none"> ○ Vasoactive Intestinal Polypeptide ○ Motilin 		
10	Urinary System	<ul style="list-style-type: none"> ● Discuss the functional anatomy of kidney ● Define nephron and its types ● Describe various parts of a nephron ● Discuss the functions of kidney ● Define GFR ● State the normal range of GFR ● Describe the glomerular filtration membrane and its function ● Discuss the forces that promote and oppose glomerular filtration ● Calculate net filtration pressure ● Discuss the significance of auto-regulation of GFR ● Describe the regulation of glomerular filtration by hormones and the nervous system ● Discuss the passive and active mechanisms of 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 (T_m) ● Discuss the tubular secretion processes in different parts of a nephron ● 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 ● Describe the neural reflex pathway that regulates emptying of bladder ● Discuss the effect of following hormones on kidney: <ul style="list-style-type: none"> ○ ADH 	<p>SGD</p> <p>IL</p> <p>SGD</p> <p>IL</p> <p>SGD</p> <p>FC</p> <p>IL</p> <p>SGD</p> <p>IL</p> <p>CBL</p> <p>IL</p> <p>CBL</p>	<p>SEQ</p> <p>MCQ</p> <p>SEQ</p> <p>MCQ</p> <p>SEQ</p> <p>MCQ</p> <p>SAQ</p> <p>MCQ</p> <p>SAQ</p> <p>MCQ</p> <p>SAQ</p>



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		<ul style="list-style-type: none"> ○ Aldosterone ○ Angiotensin II ○ ANP ○ PTH 				
	PRACTICALS By the end of the course in Physiology, students will be able to perform the following practical's:		Teaching method	Assessment Tool		
1	Foundation	<ul style="list-style-type: none"> ● Osmotic Fragility 	Lab Demo	OSPE		
2	Blood	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Using a Power lab ● Interpretation of Simple Muscle Twitch, Summation, Fatigue, Tetanization 			Lab Demo	OSPE
4	CVS	<ul style="list-style-type: none"> ● Arterial pulse examination ● ECG ● Heart Sound ● Blood Pressure ● Refractory period 				
5	Respiratory System	<ul style="list-style-type: none"> ● Lung volume and Capacities, ● Spirometry 				
6	Neurosciences	<ul style="list-style-type: none"> ● Superficial Reflexes ● Deep Reflexes ● Cerebellar function test ● Cranial nerve Examination ● Body Temperature 				
7	Special senses	<ul style="list-style-type: none"> ● Visual Acuity, ● Perimetry 				



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		<ul style="list-style-type: none">• Tuning fork test• Taste and smell		
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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.



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- 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



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Course Faculty:

Professor & HoD Physiology: Dr. Sheema Farhan

Lecturers:

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

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