

Women Medical College, Abbottabad

Study Guide

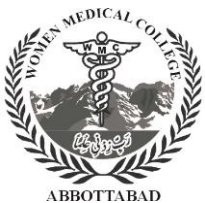
PHYSIOLOGY

WOMEN MEDICAL COLLEGE

A b b o t t a b a d

ABBOTTABAD

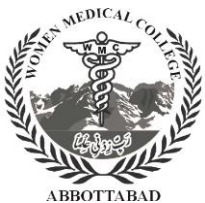
Created by:
Dept. Medical Education & Research (DME&R)



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STUDY GUIDE Department of Physiology

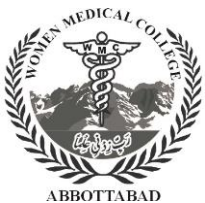
Description:

Overview:

Program	Bachelor of Medicine, Bachelor of Surgery
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Contact Hours total	400
Infrastructure Requirements	Lecture Hall Physiology Lab Tutorial room

Contact Hours/Year	
1 st year MBBS	195
2 nd Year MBBS	195
3 rd year MBBS	6
4 th Year MBBS	4
5 th year MBBS	Nil



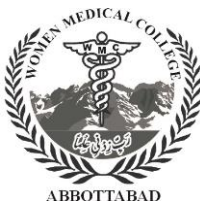
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Faculty Responsible for Course Conduction:

Sr. No	Faculty	Designation
	Dr. Salma Aslam Kundi	Professor of Physiology/ Principal WMC
	Dr. Ommia Kalsoom	Associate Professor / Head of Department
	Dr. Sidra Arshad	Associate Professor
	Dr. Yasir Ishaq	Assistant Professor
	Dr. Nadia Qamar	Senior lecturer
	Dr. Shaheen Khattak	Senior lecturer
	Dr. Shazia Ayub	Senior lecturer
	Dr. Sahar Jaffery	Senior lecturer
	Dr. Botaina Qayyum	Senior lecturer
	Dr. Shahbano	Demonstrator

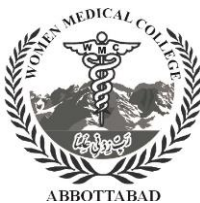
Details of Supporting Staff:

Sr. No	Staff	Designation
	Mr. Shuja	Lab Technician
	Ms. Shahabia Bano	Lab Assistant
	Ms. Shazana Bano	Computer Operator
	Mr. Sajid Abbasi	Office Attendant
	Mr. Habib ur Rehman	Lab Attendant



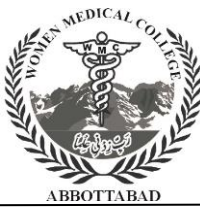
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FOUNDATION MODULE						
Class	Topic	Module	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1st Year MBBS	Physiology and its sub-branches	Foundati on	Enumerate the branches of physiology.	1	LGF	MCQs Viva
	Homeostasi s		Define homeostasis. Describe the Homeostatic mechanism of major functional systems. Describe the characteristics of control systems with examples	1	LGF	MCQs Viva
	Cell membrane physiology		Explain Intra cellular and extra cellular environment. Correlate cytoplasmic organelles with their functions. Explain the amoeboid movement of cells. Describe the ciliary movements	1+1	LGF SGF	MCQs Viva
	Membrane potential		Define membrane potential Describe ionic conc. differences across cell membrane Explain the Nernst equation. Explain origin of normal resting membrane potential	1	LGF	MCQs Viva
	Depolarizati on & Repolarizati on		Explain the role of voltage gated Na ⁺ and K ⁺ channels in action potentials. Discuss the changes in conductance of Na and K channels with changes in membrane potentials	1+1	LGF SGF	MCQs Viva
LAB WORK						



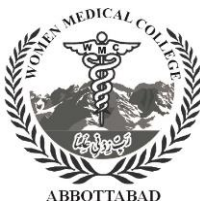
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		The Microscope		Identify parts of microscope. Demonstrate operation of microscope. Describe the method of focusing slide at different magnifications. Follow the specified norms of lab work.	2	Lab Practical	OSPE Viva
BLOOD and IMMUNOLOGY							
Class	Topic	Module	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools	
1st Yr MBBS	Introduction to blood	Blood and Immunology	Describe the composition and functions of blood. Define Hematocrit Enlist the components of plasma Explain the difference between Serum and plasma	1	LGF	MCQs Viva	
	Red Blood Cells		Describe the structure, function, life span and normal count of Red Blood Cells. Define Haemopoiesis Classify haematopoietic stem cells Summarize the erythropoiesis sites during pre-natal and post-natal periods.	1+1	LGF SGF	MCQs Viva	
	Erythropoiesis		Illustrate the stages of RBC development from pluripotent hematopoietic stem cells to a mature RBC. Describe the erythropoiesis and factors regulating erythropoiesis Describe the role of Vitamin B12 and Folic acid in RBC	1+1	LGF SGF	MCQs Viva	



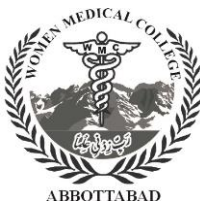
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			maturation. Describe the effects of deficiency of Vita- min B12 and Folic acid on RBC maturation			
	Erythropoitin		Describe source, control / regulation and functions of Erythropoitin Explain the role of Erythropoietin in RBC production. Describe the effects of high altitude and exercise on RBC production.			
	Anemia		Define and describe the different types of anemia Define hemolysis Describe the various red cell indices Interpret the diagnosis of anemia by using red cell indices Describe the effects of anemia on functions of circulatory system / human body	1+1	LGF SGF	MCQs Viva
	Polycythemia		Define and classify polycythemia Differentiate between primary and secondary Polycythemia	1	LGF	MCQs Viva
	White Blood Cells		Classify white blood cells Describe the structure, function, life span and normal count of White Blood Cells Describe the stages of differentiation of white blood cells (leukopoiesis) Describe the characteristics of WBCs (phagocytosis / chemotaxis, diapedesis)	1+1	LGF SGF	MCQs Viva
	Reticulo-endothelial (Monocyte-Macrophage)		Describe the components of reticulo-endothelial system (monocyte-macrophage system) Describe the role of monocyte	1+1	LGF SGF	MCQs Viva



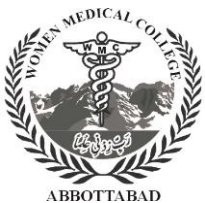
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	system		macrophage system in immunity Explain the role of neutrophils, macrophages, basophils, eosinophils and monocytes in providing immunity against infections (immune system)			
	Inflammation		Define inflammation Describe characteristics of inflammation (hallmark of inflammation) Describe the causes, sequence of events and cardinal signs of inflammation	1	LGF	MCQs Viva
	Abnormal leukocyte counts/ Leukaemia		Define Leukopenia and Leukocytosis and Leukemia	1	LGF	MCQs Viva
	Introduction to immunity		Define and classify immunity Define antigen Define pathogen Enlist the tissues that contribute to immunity and explain their function Describe the functions of immune system Describe the structure and function of lymphatic system	1+1	LGF SGF	MCQs Viva
	Immune system		Enlist the three lines of defenses and outline their properties Describe the characteristics, origin and functions of cells of immune system Describe the types of immunity Enlist the innate defenses List the substances and cells that participate in adaptive immunity Compare the characteristics innate and acquired immunity	1+1+1	LGF SGF SDL	MCQs Viva



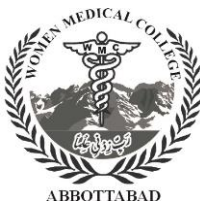
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			Compare the active and passive immunity mechanism			
	Immune response		Differentiate between primary and secondary immune response Describe the roles of cytokines, chemokines, and colony-stimulating factors in the immune response	1+1	LGF SGF	MCQ Viva
			Describe the role of T and B lymphocytes in immunity Describe the role of B lymphocytes in humoral immunity Describe cell mediated and humoral immunity Explain how helper T cells regulate the immune system Explain the function of cytotoxic T cells Describe the role of helper T cells Differentiate between humoral and cell mediated immunity	1+1+1	LGF SGF	MCQ Viva
	Complement system		Describe the complement system Explain how the complement system elicits the inflammatory response, lyses foreign cells, and increases phagocytosis Describe the two pathways that activate the complement system Compare Classic and alternate pathways pathways of complement activation	1+1	LGF SGF	MCQ Viva
	Immunity: extremes of ages		Compare the active and passive immunity Explain the transfer of passive immunity from mother to fetus	1+1	LGF SGF	MCQ Viva



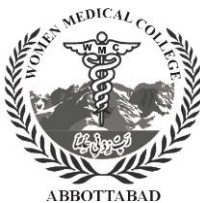
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			and from mother to infant during breast-feeding Describe changes in immune response that occurs with aging			
	Allergy & Hypersensitivity		Define allergy and allergen Describe the pathophysiology of allergy and hypersensitivity Define and classify the hypersensitivity reaction Compare the immediate and delayed hypersensitivity reactions List the diseases associated with hypersensitivity reactions	1+1	LGF SGF	MCQ Viva
	Introduction to hemostasis		Describe the structure, function, life span and normal count of Platelets. Define hemostasis Describe the role of platelets in hemostasis Outline the sequence of processes involved in hemostasis.	1+1	LGF SGF	MCQ Viva
	Blood Coagulation		Enlist the clotting factors Explain the role of calcium in coagulation Explain how clotting is prevented in the normal vascular system Outline the sequence of processes during blood coagulation Describe with the help of a flow diagram (or draw) intrinsic pathway of coagulation cascade Describe with the help of a flow diagram (or draw) extrinsic pathway of coagulation cascade	1+1+1	LGF SGF SDL	MCQ Viva



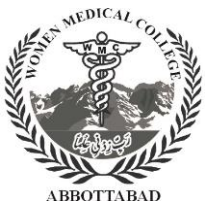
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			Explain how the mechanism of clot dissolution.			
	Bleeding disorders		Describe the role of Vit K in clotting Describe the following bleeding disorders Vitamin K deficiency Thrombocytopenia Hemophilia Define Von Willebrand disease	1+1+1	LGF SGF SDL	MCQ Viva
	Thrombotic disorders		Describe the effects of low platelet count on Hemostasis Define thrombus/thrombi Define emboli/embolus Enlist the causes of thromboembolic conditions Describe Femoral venous thrombosis and pulmonary embolism	1+1+1	LGF SGF SDL	MCQ Viva
	Blood Grouping		Describe different types of blood groups Describe the genotype-phenotype relationships in blood groups. Interpret the plausible blood groups (A-B-O) in children of parents with known blood groups. Describe the role of agglutinogens and agglutinins in blood grouping Describe the antigens and antibodies of the O-A-B blood types/ Interpret the types of agglutinins present in individuals with a specific blood group Describe the process of agglutination	1+1	LGF SGF	MCQ Viva
	Transfusion reactions		Describe the antigens and antibodies of the Rh system	1+1	LGF	MCQ



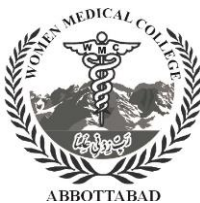
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			Describe the principles of blood typing Explain universal donor and universal recipient blood groups Enlist the manifestations of transfusion reaction		SGF	Viva
	Erythroblastosis fetalis		Define Rhesus incompatibility Describe erythroblastosis fetalis Describe the transfusion reactions resulting from mismatched O-A-B and Rh blood types	1+1	LGF SGF	MCQ Viva
	Major histocompatibility complex		Define autoimmunity Explain how immune reaction to self-antigens is avoided Define and classify Major Histocompatibility complex (MHC) Characterize the significance and function of major histocompatibility complex molecules	1+1	LGF SGF	MCQ Viva
LAB PRACTICALS						
	Hemoglobin determination		Assist in phlebotomy while practicing aseptic procedure. Determine the hemoglobin (Hb) concentration in the given sample Estimation of hemoglobin by Sahli's method Determination of packed cell volume	2	Lab Practical	OSPE VIVA
	Blood cells		Identify and describe various blood cells under microscope.	2	Lab Practical	OSPE VIVA
	RBC count		Determine the red blood cell (RBC) count in the given sample and calculate RBC	2	Lab Practical	OSPE VIVA



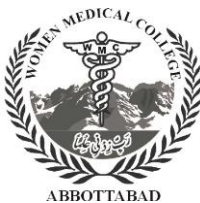
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			indices			
	TLC determination		Determine the total leukocyte count (TLC) in the given sample	2	Lab Practical	OSPE VIVA
	DLC determination		Determine the differential leukocyte count (DLC) in the given sample	2	Lab Practical	OSPE VIVA
	Clotting time determination		Determine the clotting time	2	Lab Practical	OSPE VIVA
	Bleeding time determination		Determine the bleeding time	2	Lab Practical	OSPE VIVA
	Prothrombin time determination		Determine the Prothrombin time (PT) in the given sample	2	Lab Practical	OSPE VIVA
	Blood grouping		Determine the O-A-B and Rh blood group in the given sample	2	Lab Practical	OSPE VIVA
	Blood smear preparation		Prepare blood smear by thumb prick method.	2	Lab Practical	OSPE VIVA
	Blood Bank		Observe the process of blood donation, blood product separation, screening and storage and observe the process of blood transfusion.	2	Lab Practical	OSPE VIVA
MSK MODULE						
	Skeletal vs smooth muscle		Differentiate between skeletal muscle and smooth muscle.	1	LGF SGF	MCQ Viva



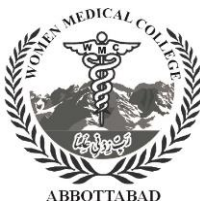
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	Mechanism of muscle contraction		Describe the general mechanism of muscle contraction. Describe the molecular mechanism of muscle contraction	1+1	LGF SGF	MCQ Viva
	Energetics of muscle contraction		Describe the energetics of muscle contraction.	1	LGF SGF	MCQ Viva
	Terms related to MSK		Describe the following terms related to MSK Excitable tissue Stimulus Threshold Depolarization Hyperpolarization Presynaptic potential Post synaptic potential Goldmann Equation Nernst Equation	1+1	LGF SGF	MCQ Viva
	Describe the important terms		Describe the following Motor unit Summation Tetanization Staircase effect Skeletal muscle tone Muscle fatigue Agonist Antagonists Coactivation of agonist and antagonist	1+1	LGF SGF	MCQ Viva
	Excitation contraction coupling in skeletal muscles		Discuss the process of excitation contraction coupling in skeletal muscles. Explain Transverse tubule-sarcoplasmic reticulum system Describe Release of Calcium ions by sarcoplasmic reticulum Explain Role of Calcium pump Describe Excitatory pulse of Ca ⁺	1+1	LGF SGF	MCQ Viva
	Muscle action potential		Describe the muscle action potential.	1	LGF	MCQ
	Excitation contraction coupling		Describe excitation contraction coupling of skeletal muscle.	1	LGF	MCQ



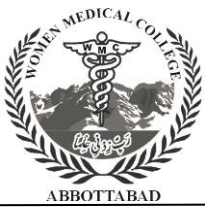
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					SGF	Viva
	Physiologic anatomy of the skeletal muscle fiber		<p>Explain the physiologic anatomy of the skeletal muscle fiber.</p> <p>Skeletal muscle fiber</p> <p>Sarcolemma</p> <p>Myofibrils</p> <p>I band</p> <p>A band</p> <p>Z disk</p> <p>M line</p> <p>Sarcomere</p> <p>Titin microfilament molecules</p> <p>Sarcoplasm</p> <p>Sarcoplasmic reticulum</p>	1	LGF	MCQ
					SGF	Viva
	Characteristics of whole muscle contraction		<p>Identify the characteristics of whole muscle contraction.</p> <p>Compare isotonic and isometric exercises.</p> <p>Compare and contrast slow and fast muscle fibers.</p> <p>Describe the mechanics of skeletal muscle contraction.</p> <p>Describe muscle tone and muscle fatigue.</p> <p>Describe lever systems of the body and positioning of a body part.</p> <p>Describe remodeling of muscle to match function.</p>	1	LGF	MCQ
						Viva
	Neuromuscular junction		<p>Describe the transmission of impulses from nerve endings to skeletal muscle fibers.</p> <p>Explain the physiologic anatomy of the neuromuscular junction</p>	1	SGF	MCQ
						Viva
	Neuromuscular Transmission		<p>Explain the mechanism of transmission of impulses from nerve endings to muscle fibers</p> <p>Explain Formation and Secretion of acetylcholine at nerve terminals</p> <p>Describe Action of</p>	1	LGF	MCQ
						Viva



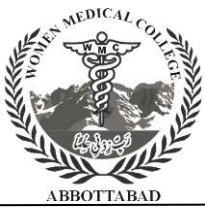
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			<p>acetylcholine at postsynaptic membrane</p> <p>Describe Degradation/Destruction of released acetylcholine</p> <p>Describe End plate potential</p> <p>Describe Fatigue of junction</p>			
	Neuromuscular drugs		<p>Describe the physiologic basis of the drugs used in the neuromuscular disorders (Drugs that enhance or block the transmission at neuromuscular junction)</p> <p>Enlist the excitatory and inhibitory transmitter substances secreted at the smooth muscle neuromuscular junction</p> <p>Drugs that stimulate the muscle fiber by acetylcholine like action</p> <p>Drugs that stimulate neuromuscular junction by inactivating acetylcholinesterase</p> <p>Drugs that block transmission at the neuromuscular junction</p> <p>Enlist the excitatory and inhibitory transmitter substances secreted at the smooth muscle neuromuscular junction</p>	1	LGF	<p>MCQ</p> <p>Viva</p>
	Myasthenia gravis		Describe the pathophysiology of myasthenia gravis			
	Smooth muscle		<p>Classify smooth muscles</p> <p>Describe the physiologic anatomy of the smooth muscle neuromuscular junction</p>	1	LGF	<p>MCQ</p> <p>Viva</p>
	Skeletal		Discuss in detail types of muscles and arrangement of	1	SGF	MCQ



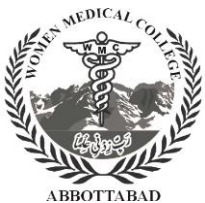
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	Muscle fiber		skeletal muscle fibers.			Viva
	Contraction of smooth muscle		<p>Describe the contractile mechanisms in smooth muscles</p> <p>Describe excitation and contraction of smooth muscle.</p> <p>Identify the types of smooth muscles.</p> <p>Describe the chemical and physical basis for smooth muscle contraction.</p> <p>Compare smooth and skeletal muscle contraction.</p> <p>Chemical basis of smooth muscle contraction</p> <p>Physical basis of smooth muscle contraction</p> <p>Explain how the calcium ions regulate the contraction.</p> <p>Regulation of smooth muscle contraction by the calcium ions</p> <p>Enlist the excitatory and inhibitory transmitter substances secreted at the smooth muscle neuromuscular junction</p>	1	LGF	<p>MCQ</p> <p>Viva</p>
	Nervous and hormonal control of smooth muscle contraction		Describe the nervous and hormonal control of smooth muscle contraction	1	LGF	<p>MCQ</p> <p>Viva</p>
	Resting Membrane Potential		<p>Enumerate the intracellular and extracellular concentrations of sodium, potassium, chloride and calcium ions in a resting/normal cell.</p> <p>Describe the characteristics</p>	1	LGF	<p>MCQ</p> <p>Viva</p>



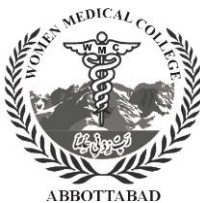
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			of major membrane ion channels and their role in the membrane potential Describe the resting membrane potential in a cell/nerve fiber			
	Muscle Remodeling		Describe following Muscle hypertrophy Muscle atrophy Muscle hyperplasia Rigor mortis Muscle dystrophy Recovery of muscle contraction in poliomyelitis	1	SGF	MCQ Viva
	Membrane potentials and action potentials in smooth muscles		Describe the membrane potentials and action potentials in smooth muscles. Describe Spike potentials Describe Action potentials with plateaus Describe Role of calcium channels in generating the smooth muscle action potential Describe Slow wave potentials Describe Excitation of visceral smooth muscle by muscle stretch Describe Depolarization of multi-unit smooth muscle without action potentials	1	LGF	MCQ Viva
	Control of smooth muscle contraction		Describe the mechanism nervous, hormonal and local control of smooth muscle contraction.	1	LGF	MCQ Viva
	Smooth muscle and skeletal muscle contraction		Compare the smooth muscle contraction and skeletal muscle contraction	1	LGF	MCQ Viva



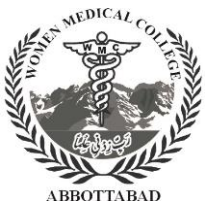
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	Skeletal muscle contraction		Describe the three sources of energy for muscle contraction Compare isometric and isotonic contractions Compare characteristics of fast and slow muscle fibers. Sources of energy for muscle contraction Compare isometric and isotonic contractions Compare characteristics of fast and slow muscle fibers	1	SGF	MCQ Viva
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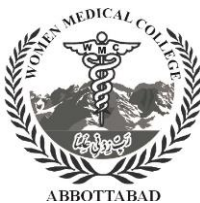
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CARDIOVASCULAR MODULE							
1- Chest Pain							
1	1 st year MBBS	Cardiac muscles	CVS	Explain the physiologic anatomy of the cardiac muscle Describe the properties of the cardiac muscle	2	LGF	Summative Assessment MCQ
2	1 st year MBBS	Coronary circulation	CVS	Describe the physiologic basis coronary circulation Describe the steps of coronary thrombosis Describe the etiology of coronary thrombosis	3	LGF	Summative Assessment MCQ
2- Breathlessness and ankle swelling							
3	1 st year MBBS	Cardiac cycle		Describe the Cardiac cycle Describe the concept of systole and diastole, Describe the role of atria and ventricles as pumps, Describe the functions of heart valves, Correlate the cardiac cycle events with ECG Describe the mechanism of production of normal and abnormal heart sounds Relate heart sounds with cardiac cycle, Describe the metabolism and oxygen utilization of cardiac muscle Describe the regulation of cardiac cycle	4	LGF SGF VIDEOS LAB	Summative Assessment MCQ
4	1 st year MBBS	Cardiac output	CVS	Describe pressure volume loop (end-systolic volume / end-diastolic volume /	6	LGF SGF	Summative Assessment



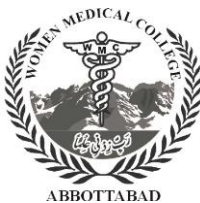
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				<p>ejection fraction / systolic volume / systolic work output)</p> <p>Explain the Frank-Starling mechanism of the heart for the control of cardiac output by venous return</p> <p>Describe the methods for measuring of cardiac output</p> <p>Describe normal cardiac output and venous return during rest and during activity</p> <p>Enlist the causes of abnormally high and abnormally low cardiac output</p> <p>Explain the mechanisms of normal cardiac contractility and the role of calcium ion/ ATPase pumps</p> <p>Explain cardiac output (regulation/measurement) and peripheral resistance and its regulation</p> <p>Explain the factors regulating cardiac output and venous return.</p>			MCQ
5	1 st year MBBS	Blood flow	CVS	<p>Describe the Biophysics and Interrelationships of Pressure, Flow, and Resistance in terms of Ohm's law and Poiseuille's Law</p> <p>Describe Starling forces</p> <p>Describe regulation of blood flow</p> <p>Define basal tone.</p> <p>List several substances potentially involved in local metabolic control of vascular tone.</p> <p>State the local metabolic vasodilator hypothesis.</p> <p>Describe physiological</p>	6	LGF SGF	Summative Assessment MCQ



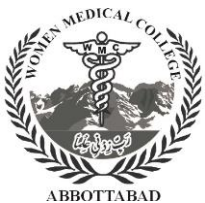
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				<p>Vasodilators and Vasoconstrictors and their mechanisms</p> <p>Describe the factors affecting the local blood flow including auto-regulation.</p> <p>Describe the function of capillaries</p> <p>Describe circulatory changes during exercise</p> <p>Describe blood flow to different organs like brain, heart, liver and skin during exercise</p>			
6	1 st year MBBS	Functions of heart valves	CVS	<p>Describe the functions of mitral, tricuspid, aortic and pulmonic valves</p> <p>Describe the hemodynamics and sequel related to stenosis and regurgitation of heart valves</p>	2	LGF SGF VIDEOS	Summative Assessment MCQ
7	1 st year MBBS	Lymphatic system	CVS	<p>Describe the function of lymphatic system in the maintenance of interstitial fluid volume.</p> <p>Describe the effects of Interstitial Fluid Pressure on Lymph Flow.</p> <p>Describe how changes in capillary hydrostatic pressure, plasma oncotic pressure, capillary permeability, and lymphatic function can lead to tissue edema</p>	3	LGF SGF	Summative Assessment MCQ
3- Blood Pressure							
8	1 st year MBBS	Blood Pressure	CVS	<p>Define blood pressure</p> <p>Describe the causes of High / low BP</p> <p>Discuss the mechanisms for rapid and long term control of blood pressure (including</p>	4	LGF SGF LAB	Summative Assessment MCQ



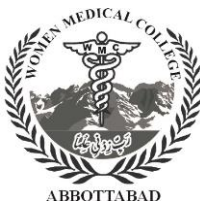
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				Renin Angiotensin system) Describe the effects of sympathetic and parasympathetic stimulation on the heart and circulation			
9	1 st year MBBS	Circulatory Shock	CVS	Define Circulatory Shock Explain the physiologic causes of circulatory shock Explain the stages of circulatory shock Describe cardiogenic shock Describe Hemorrhagic Shock Describe of Neurogenic Shock Describe Anaphylactic Shock Describe Septic Shock Explain the physiology of treatment in Shock	2	LGF	Summative Assessment MCQ
4- Palpitations							
10	1 st year MBBS	Excitation and contraction of cardiac muscles	CVS	Describe the excitation–contraction process in cardiac muscle. Describe Chronotropic, Inotropic and Dromotropic Effects Describe Chronotropic, Inotropic and Dromotropic Effects Differentiate excitation–contraction process in cardiac and skeletal muscle cells Describe gap junctions and the significance of functional syncytium Explain phases of cardiac muscle action potential Describe the characteristics of cardiac action potentials	5	LGF SGF	Summative Assessment MCQ



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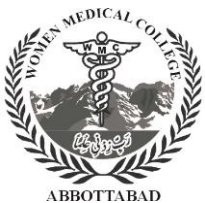
				<p>and the role of “slow calcium” channels in causing plateau and its significance</p> <p>Describe the significance of AV nodal Delay</p> <p>Define Pacemaker and explain why SA node is the normal pacemaker of the heart</p> <p>Define Ectopic Pacemaker and describe its causes</p> <p>Describe the effects of sympathetic and parasympathetic stimulation on the heart rate and conduction of cardiac action potentials</p> <p>Define various types of refractory periods</p> <p>Differentiate the refractory period of cardiac muscle with that of skeletal muscle</p> <p>Describe the significance of prolonged action potential in cardiac muscle</p> <p>Describe the physiological anatomy of the sinus node</p> <p>Define automaticity and rhythmicity and conductivity</p> <p>Describe the specialized excitatory and conductive pathway of the cardiac muscle tissue</p>			
11	1 st year MBBS	ECG	CVS	<p>Describe the characteristics of normal ECG, time duration of waves, segments and voltages</p> <p>Explain how to record ECG</p> <p>Describe the AV nodal, ventricular impulse conduction</p> <p>Interpret ECG paper and its calibration</p>	3	LGF SGF LAB	Summative Assessment MCQ



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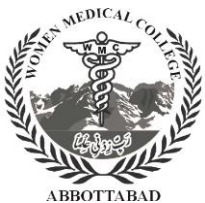
LAB PRACTICALS						
		Basic life support		Perform basic life support	2	Skill lab
		Blood pressure.		Measure the blood pressure. Measurement of blood pressure by palpatory method Measurement of blood pressure by palpatory method Measurement of effect of posture and exercise on blood pressure.	2	Lab Practical
		Arterial pulses		Examination of the arterial pulses e.g Radial, Brachial, Carotid, Femoral and popliteal.	2	Lab Practical
		Apex beat		Examination and location of apex beat	2	Lab Practical
		The heart sounds.		Auscultate areas of the heart sounds. First heart sound 2 nd heart sound	2	Lab Practical
		Jugular Venous Pulse JVP		Measurement of Jugular Venous Pulse JVP	2	Lab Practical
		ECG		Interpretation and recording of ECG	2	Lab Practical

RESPIRATORY MODULE



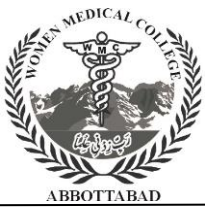
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S. No.	Class	Topic	Module	Learning Outcomes	TeachingHours	Mode of Teaching	Assessment Tools
1- Chest Wall Injury							
1	1 st year MBBS	Mechanics of Respiration	Respiration	Describe the mechanics of respiration Describe the pressures that cause the movements of the air in and out of the lungs	1	LGF	Summative Assessment MCQ
2	1 st year MBBS	Lung compliance	Respiration	Define compliance of the lung and elastic recoil Identify two common clinical conditions in which lung compliance is higher or lower than normal.	1	LGF	Summative Assessment MCQ
3	1 st year MBBS	Lung volumes and capacities	Respiration	Describe changes in the lung volume, alveolar pressure, pleural pressure, and trans-pulmonary pressure during normal breathing Draw a normal pulmonary pressure-volume (compliance) curve (starting from residual volume to total lung capacity and back to residual volume), labeling the inflation and deflation limbs. Explain the cause and significance of the hysteresis in the curves.	2	LGF SGF	Summative Assessment MCQ



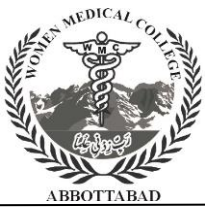
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				Draw the pressure-volume (compliance) curves for the lungs, chest wall, and respiratory system on the same set of axes. Show and explain the significance of the resting positions for each of these three structures.			
2- Cough and Hemoptysis							
4	1 st year MBBS	Functions of respiratory passageways	Respiration	Describe the respiratory and non-respiratory functions of the respiratory passageways Identify the mechanism by which particles are cleared from the airways.	2	LGF SGF	Summative Assessment MCQ
3- Breathlessness							
5	1 st year MBB S	Pulmonary ventilation	Respiration	Define respiration Compare between the internal and external respiration Enlist the steps of external respiration accomplished by the respiratory system and those carried out by the circulatory system State the functions of Type I alveolar cells, Type II alveolar cells, and alveolar macrophages Describe the forces that keep the alveoli	6	LGF SGF	Summative Assessment MCQ



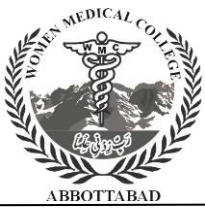
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				<p>open and those that promote alveolar collapse</p> <p>Define the following terms: anatomic dead space, physiologic dead space, wasted (dead space) ventilation, total minute ventilation and alveolar minute ventilation.</p> <p>Compare anatomic and physiologic dead space</p> <p>Describe the basic concept of measurement of dead space</p> <p>Enlist the factors that changes the dead space</p> <p>Define the following terms: hypoventilation, hyperventilation, hypercapnea, eupnea, hypopnea, and hyperpnea.</p> <p>Define surface tension, surfactants, atelectasis</p> <p>Describe the role of surfactants on the lung compliance.</p> <p>Describe the composition of the pulmonary surfactants and its role</p> <p>Describe the pathophysiology of</p>			
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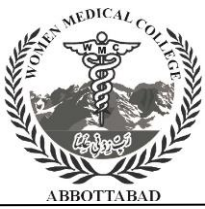
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				respiratory distress syndrome of the newborn Discuss the work of breathing			
6	1 st year MBB S	Pulmonary circulation	Respiration	<p>Explain the physiologic anatomy of the pulmonary circulatory system</p> <p>Describe the pressures in the pulmonary circulatory system</p> <p>Describe blood volume of the lungs</p> <p>Describe blood flow through the lungs and its distribution</p> <p>Compare the systemic and pulmonary circulations with respect to pressures, resistance to blood flow, and response to hypoxia.</p> <p>Describe the regional differences in pulmonary blood flow in an erect position.</p> <p>Describe the consequence of hypoxic pulmonary vasoconstriction on the distribution of pulmonary blood flow.</p> <p>Describe the pulmonary capillary dynamics</p> <p>Describe the</p>	2	LGF	Summative Assessment MCQ



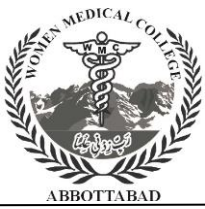
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				development of pulmonary edema			
7	1 st year MBB S	Gas exchange	Respiration	<p>List the normal airway, alveolar, arterial, and mixed venous PO₂ and PCO₂ values.</p> <p>List the normal arterial and mixed venous values for O₂ saturation, [HCO₃⁻]</p> <p>List the factors that affect diffusive transport of a gas between alveolar gas and pulmonary capillary blood.</p> <p>Describe respiratory unit</p> <p>Describe the physiologic anatomy of the respiratory membrane and its significance</p> <p>Describe the factors that affect the rate of gaseous diffusion through the respiratory membrane</p> <p>Describe the diffusing capacity of respiratory membrane for O₂ and CO₂ at rest and exercise.</p> <p>Describe the effect of ventilation/perfusion (V/Q) ratio on</p>	5	LGF SGF	Summative Assessment MCQ



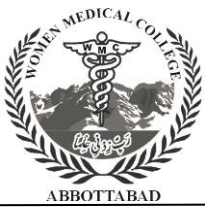
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				<p>alveolar gas concentrations.</p> <p>Identify the average V/Q ratio in a normal lung.</p> <p>Explain the concept of physiologic shunt and physiologic dead space</p> <p>Describe the abnormalities of ventilation perfusion ratio in normal lung and chronic obstructive lung disease.</p> <p>Enlist common causes of hypoxemia</p>			
8	1 st year MBB S	Transport of O ₂ and CO ₂ in the blood	Respiration	<p>Define oxygen partial pressure (tension), oxygen content, and percent hemoglobin saturation as they pertain to blood.</p> <p>Describe Oxyhemoglobin dissociation curve (hemoglobin oxygen equilibrium curve) showing the relationships between oxygen partial pressure, hemoglobin saturation, and blood oxygen content.</p> <p>Describe the relative amounts of O₂ carried bound to hemoglobin with that carried in the</p>	5	LGF SGF	



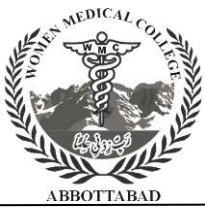
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				<p>dissolved form.</p> <p>State Henry's Law (the relationship between PO₂ and dissolved plasma O₂ content)</p> <p>Describe how the shape of the oxyhemoglobin dissociation curve influences the uptake and delivery of oxygen.</p> <p>Define P₅₀.</p> <p>Describe how the oxyhemoglobin dissociation curve is affected by changes in blood temperature, pH, PCO₂, and 2,3-DPG.</p> <p>Describe how anemia and carbon monoxide poisoning affect the shape of the oxyhemoglobin dissociation curve, PaO₂, and SaO₂.</p> <p>List the forms in which carbon dioxide is carried in the blood.</p> <p>Describe the percentage of total CO₂ transported as each form.</p> <p>Describe the chloride shift and its importance in the transport of CO₂ by the blood.</p> <p>Describe the enzyme</p>		
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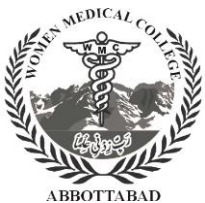
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				<p>that is essential to normal carbon dioxide transport by the blood and its location.</p> <p>Describe the carbon dioxide dissociation curves for oxy- and deoxyhemoglobin.</p> <p>Describe the interplay between CO₂ and O₂ binding on hemoglobin that causes the Haldane effect.</p>		
9	1 st year MBB S	Regulation of Respiration	Respiration	<p>Describe the regions in the central nervous system that play important roles in the generation and control of cyclic breathing.</p> <p>Give three examples of reflexes involving pulmonary receptors that influence breathing frequency and tidal volume. Describe the receptors and neural pathways involved.</p> <p>List the anatomical locations of chemoreceptors sensitive to changes in arterial PO₂, PCO₂, and pH that participate in the control of ventilation. Identify the relative importance of each in sensing alterations in blood gases.</p>	3	LGF SGF



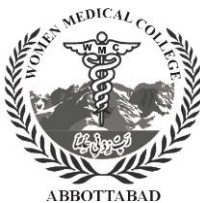
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				<p>Describe how changes in arterial PO₂ and PCO₂ alter alveolar ventilation, including the synergistic effects when PO₂ and PCO₂ both change.</p> <p>Describe the significance of the feedforward control of ventilation (central command) during exercise, and the effects of exercise on arterial and mixed venous PCO₂, PO₂, and pH.</p> <p>Describe voluntary control of respiration</p> <p>Describe the effect of irritant receptors, J-receptors, brain edema and anesthesia on breathing.</p>		
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10	1 st year MBB S	Common Respiratory abnormalities	Respiration	<p>Describe periodic breathing and basic mechanism of Cheyne-Stokes breathing</p> <p>Define sleep apnea</p> <p>Describe the pathophysiology of Obstructive sleep apnea and central sleep apnea.</p> <p>Describe the pathophysiology of specific pulmonary abnormalities:</p> <p>Describe hypoxia</p> <p>Describe cyanosis</p> <p>Describe the effect of aging on lung volumes, lung and chest wall compliance, blood gases, and respiratory control.</p>	3	LGF SGF LAB
LAB PRACTICALS						
	Peak flow rate	Respiratory Module	Determine the peak expiratory flow (PEF) by peak flow meter	2	Lab Practical	OSPE VIVA
	Spirometry		<p>Draw a normal spirogram, labeling the four lung volumes and four capacities.</p> <p>List the volumes that comprise each of the four capacities.</p> <p>Identify which volume and capacities cannot be measured by spirometry.</p> <p>Define the factors that determine total lung capacity, functional residual capacity, and residual volume.</p>	2	Lab Practical	OSPE VIVA

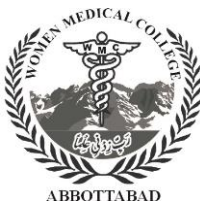


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			Describe the mechanisms responsible for the changes in those volumes that occur in patients with emphysema and pulmonary fibrosis.			
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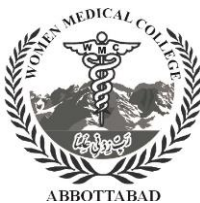
NEUROSCIENCE MODULE

Class	Topic	Module	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools		
2nd Year MBBS	Organization of the Nervous System	CNS	Describe general design of the nervous system	1	LGF	MCQs Viva		
			Describe various divisions of the nervous system.					
			Describe structural and functional unit of CNS.					
			Describe Functional components of Neuron.	1			SGF	MCQs Viva
			Describe Functional and Structural classification of Neurons					
			Describe major levels of central nervous system function					
			Describe Glial cells and their functions.					
	Compare nervous system to a computer							
	Basic function of synapse		Define and classify synapses	1	LGF	MCQs Viva		
			Explain physiological structure of synapse					
Describe Mechanism by Which an Action Potential Causes Transmitter Release from the Presynaptic Terminals								
Describe synaptic transmission and explain properties of synaptic transmission.			1	SGF			MCQs Viva	



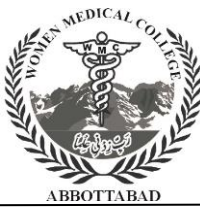
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			Describe mechanism of action of neurotransmitter on the post synaptic membrane.	1	LGF	MCQs Viva
			Describe Second messenger system in the post synaptic neuron	1	LGF	MCQs Viva
	Functions of neurotransmitters		Define the characteristics of a neurotransmitter	1	LGF	MCQs Viva
			Enumerate the neurotransmitters involved in central nervous system.			
			Classify neurotransmitters and describe the actions of some common neurotransmitters in central nervous system.	1	SGF	MCQs Viva
	Electrical Events during Neuronal Excitation and Inhibition		Describe resting membrane potential of the neuronal soma.			
			Describe Effect of Synaptic Excitation on the Postsynaptic Membrane—Excitatory Postsynaptic Potential.	1	LGF	MCQs Viva
			Describe Effect of Inhibitory Synapses on the Postsynaptic Membrane—Inhibitory Postsynaptic Potential.			
			Describe Generation of Action Potentials in the Initial Segment of the Axon Leaving the Neuron—Threshold for Excitation			
	Sensory receptors		Define and classify receptors.	1	LGF	MCQs Viva
			Classify receptors according to their location in the body.			
			Describe specific functions of receptors.			



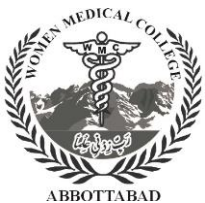
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			Describe Receptor or generation potential	1	SGF	
			Discuss mechanism of action of sensory transduction.			
	Coding of sensory information		Describe Doctrine of specific nerve energies	1	LGF	MCQs Viva
			Describe Modality of Sensation—The “Labeled Line Principle”			
			Define and discuss law of projection			
			Discuss properties of stimulus; modality, Stimulus location Stimulus intensity Stimulus duration			
			Describe Frequency of action potentials with threshold level of receptor potential	1	SGF	MCQs Viva
	Transmission and Processing of Signals in CNS		Describe Relaying of signals through Neuronal pools; Divergence, Convergence, Prolongation of Signals	1	LGF	MCQs Viva
	Types of nerve fibers, its regeneration and degeneration		Describe the mechanism of degeneration & regeneration.	1	LGF	MCQs Viva
			Describe the duration required for regeneration inside & out of CNS.			
			Enumerate the causes of degeneration.			
			Discuss Wallerian degeneration			
			Identify the microscopic appearance of degenerating neurons			
	Somatic		Describe Tactile receptors in the skin and their functions: Pacinian	1	LGF	MCQs



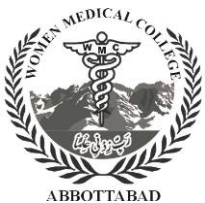
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	Sensations		corpuscles, Meissner's corpuscles, Ruffini endings, Merkle cell, A-delta and C free nerve endings			Viva
	Transmission in the Dorsal column–medial Lemniscal system		Describe ascending pathways and enumerate the differences between the two.	1	LGF	MCQs Viva
			Describe Transmission in the Dorsal column–medial Lemniscal system			
			Describe Spatial Orientation of the Nerve Fibers in the Dorsal Column–Medial Lemniscal System	1	SGF	MCQs Viva
			Describe two-point discrimination			
	Somatosensory Cortex		Identify the diagrammatic representation of different areas of the body in the somatosensory cortex I	1	LGF	MCQs Viva
			Identify Broadman's areas of cerebral cortex and correlate each one of them with their respective functions.			
			Describe the functions of somatosensory area I.	1	SGF	MCQs Viva
			Describe layers of the somatosensory cortex and their function.			
			Describe the functions of somatosensory association area			
	Transmission of Sensory signals in the		Differentiate the submodalities of nondiscriminative touch, temperature and nociception based on receptor transduction mechanism, localization within the	1	LGF	MCQs Viva



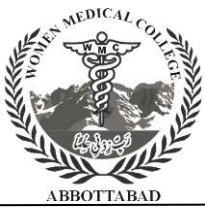
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	Anterolateral pathway		spinal gray matter, and central termination of the pathways.			
			Describe functional organization at all levels and sub-modalities served by the anterolateral system and the equivalent components of the spinal trigeminal system.			
	Introduction to Motor Nervous System (General Principles)		Describe organization of the spinal cord for motor functions	1	LGF	MCQs Viva
			Give an overview of the components of nervous system involved in motor control			
			Identify and differentiate upper and lower motor neurons			
			Describe the types of anterior horn cells			
			Describe the concept of Final Common Path			
			Describe broad types of motor activities			
	Motor functions of Spinal cord I: Stretch Reflex		Describe structural organization of the muscle spindle	1	LGF	MCQs Viva
			Define a reflex action and enlist components of reflex arc.			
			Describe types of reflexes and their level of integration.			
			Describe Stretch Reflex			
			Differentiate between Static (Tonic) and Dynamic (Phasic) stretch reflex	1	LGF	MCQs Viva
			Describe Functions of muscle			



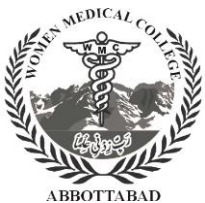
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			spindle			
			Discuss physiological significance of these reflexes.			
			Describe Functions of Gamma efferent system			
			Describe the role of the muscle spindle in voluntary motor activity	1	SGF	MCQs Viva
	Motor functions of Spinal cord II: Golgi Tendon Reflex, Withdrawal Reflexes		Describe Golgi Tendon Reflex	1	LGF	MCQs Viva
			Differentiate between muscle spindle and Golgi tendon organ.			
			Describe types of polysynaptic reflexes and their level of integration.			
			Discuss physiological significance of these reflexes.	1	SGF	MCQs Viva
			Describe reciprocal inhibition and reciprocal innervation			
	Support of the body against gravity, Reflexes of Posture And Locomotion		Describe Positive Supportive Reaction	1	LGF	MCQs Viva
			Describe Cord "Righting" Reflexes.			
			Describe stepping and walking movements			
			Describe Excitatory-Inhibitory	1	SGF	MCQs



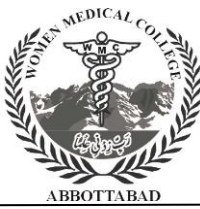
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			Antagonism Between Pontine and Medullary Reticular Nuclei			Viva
	Vestibular Sensations and Maintenance of Equilibrium		Describe the physiologic anatomy of vestibular apparatus	1	LGF	MCQs Viva
			Describe function of the utricle and saccule in the maintenance of static equilibrium			
			Describe function of semicircular ducts			
			Describe Neuronal Connections of the Vestibular Apparatus	1	SGF	MCQs Viva
			Describe Vestibular mechanism for stabilizing the eyes			
	Lesions of the Spinal Cord: Upper and Lower Motor Neuron lesion		Define muscle tone and describe its significance.	1	LGF	MCQs Viva
			Explain the sequence of events during development of muscle tone.			
			Discuss spinal shock			
			Differentiate between signs of the upper and lower motor neurons.	1	SGF	MCQs Viva
	Hemi-section of spinal cord		Describe the clinical features of Brown Sequard syndrome	1	LGF	MCQs Viva
			Describe the etiology, clinical features, investigations and management of a patient with paraplegia			



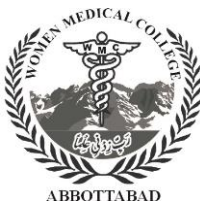
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	Involuntary function of brain		Describe the involuntary functions of the brain	1	SDL	
	Functions of reticular activating system		Describe the structure and functions of RAS	1	SGF	MCQs Viva
	Coma and brain death		Define coma and describe brain death			
	The Autonomic Nervous System 1		Describe the differences in the locations, level and organization of sympathetic and parasympathetic nervous system.	1	LGF	MCQs Viva
			Identify the target organs of sympathetic and parasympathetic nervous system.			
			Describe the distribution of afferent and efferent sympathetic and parasympathetic fibers to their respective target organs.			
			Contrast the sympathetic and parasympathetic branches of the autonomic nervous system based on: spinal cord division of origin, length of preganglionic and postganglionic neurons, neurotransmitters and receptors at the ganglionic and target organ synapse.			
	The Autonomic Nervous System 2		Discuss basic characteristics of sympathetic and parasympathetic functions	1	LGF	MCQs Viva
			Describe receptors on the effector organs			
			Describe function of the adrenal medullae			
			Describe sympathetic and parasympathetic "tone"			
			Describe "alarm" or "stress"			



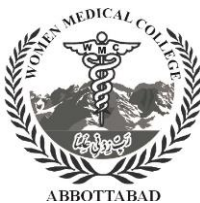
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			response of the sympathetic nervous system			
	Cortical Control of Motor Functions		Describe Motor Functions of Specific Cortical Areas	1	LGF	MCQs Viva
			Describe transmission of signal from the motor cortex to the muscles. (Pyramidal and extrapyramidal).			
			Explain the excitation of the spinal cord motor control areas by the primary motor cortex and red nucleus.			
	Functions of Descending Tracts		Describe the functions of Descending Tracts	1	LGF	
			Describe Decerebrate and Decorticate Rigidity			
	Cerebellum I: Basic Circuit and Connections		Describe the divisions of cerebellum into 3 lobes and their connections.	1	LGF	MCQs Viva
			Describe Interconnections of neurons of cerebellar cortex			
			Describe Cerebellar afferent fibers			
			Describe Cerebellar efferent fibers			
			Describe the functional circuits of cerebellum			
	Cerebellum II: Functions and Disorders		Explain the functional differences between vermis and cerebellar hemispheres.	1	LGF	MCQs Viva
			Describe Functions of vestibulocerebellum			
			Describe Functions of spinocerebellum			



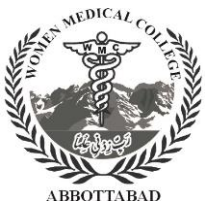
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			Describe Functions of cerebrotocerebellum			
			Describe the clinical abnormalities of cerebellum			
	Basal Ganglia I: Pathways and connections		Describe the anatomical and physiological classification of basal ganglia.	1	LGF	MCQs Viva
			Describe the functional circuits of basal ganglia.			
			Describe connections of putamen circuit.			
			Describe connections of caudate circuit.			
			Enlist the differences between direct and indirect pathways			
	Basal Ganglia II: Functions and Diseases		Describe functions of putamen circuit.	1	LGF	MCQs Viva
			Describe functions of caudate circuit.			
			Explain the clinical problems related to basal ganglia			
	Pain Sensation Pathways		Describe pain receptors and type of stimuli causing pain.	1	LGF	MCQs Viva
			Describe types of pain.			
			Explain in detail the pathway for pain.			
	Pain suppression (analgesia) System in the brain and Spinal cord		Define analgesia			



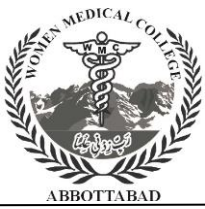
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			Explain pain suppression system in the brain and spinal cord.			
			Describe Gate control theory and Brain Opiate system			
			Describe clinical abnormalities of pain: Primary and Secondary Hyperalgesia			
	Headache, Referred Pain		Define referred pain and describe its mechanism.	1	SGF	MCQs Viva
			Describe the clinical significance of referred pain with examples.			
			Enumerate the causes of referred pain.			
			Enlist the causes of intra-cranial and extra-cranial headache and correlate with the underlying mechanism of pain.			
	Thermal Sensations		Describe thermal receptors and their excitation	1	LGF	MCQs Viva
			Describe mechanism of stimulation of thermal receptors			
			Describe transmission of thermal signals in the nervous system			
	Functions of Specific Cortical Areas (Concept of Dominant Hemisphere)		Name the association areas of brain. Briefly describe their location and function?	1	LGF	MCQs Viva
			Draw the diagram of cerebral cortex to show the different functional areas			
	Language		Define and classify speech			



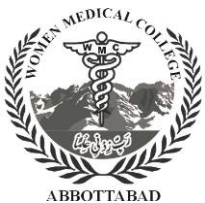
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	and Speech					
			Describe how the brain performs the function of speech.			
			Describe Broca's area in the brain, and its function.			
			Describe wernicke's area in the brain, and its function.			
			Describe the speech pathways for perceiving a heard word and then speaking the same word & perceiving a written word and repeating it and correlate it with their clinical significance	1	SGF	MCQs Viva
			Describe the effects of damage to Broca's area and Wernicke's area			
			Describe disorders related to speech.			
	Learning and Memory		Define and classify memory and explain its basic mechanism.	1	SGF	MCQs Viva
			Describe the mechanism of synaptic facilitation and synaptic inhibition			
			Describe consolidation of memory, and briefly describe one of its most important features.			
			Describe Codifying of new memories			
			Role of specific parts of the brain in the memory process			
			Explain disorders related to memory.			
	Activating-Driving Systems of the Brain		Describe bulboreticular facilitatory area. Explain continuous stimulation from lower brain by four neurohormonal systems.	1	LGF	MCQs Viva
			Explain continuous stimulation from lower brain by four			



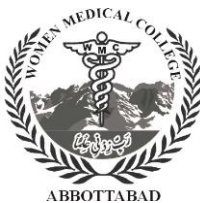
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			neurohormonal systems.			
	Limbic System		Describe the principal components of the limbic system: hippocampus, amygdala, prefrontal cortex, and nucleus accumbens), the pathways connecting them and their functions.	1	SGF	MCQs Viva
			Discuss the anatomy of memory and emotion in relation to the limbic system			
			Describe Functions of limbic system			
			Describe the connection of hypothalamus with different areas of brain.			
			Describe the vegetative and endocrine functions of hypothalamus.			
			Describe the behavioral functions of hypothalamus.			
	Brain Waves and Sleep		Describe brain waves.	1	LGF	MCQs Viva
			Describe the clinical significance of EEG.			
			Define sleep. Describe its various types and characteristics.			
			Describe basic theories of sleep.			
			Describe genesis of n-REM and REM sleep.			
			Enumerate the neurotransmitters involved in sleep.			
			Describe various sleep disorders.			
	Seizures and Epilepsy		Define seizure and epilepsy.	1	SGF	MCQs Viva
			Classify seizures & epilepsies			
			Enumerate causes of seizure and			



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			epilepsy.			
			Discuss the clinical features of patient presents with epilepsy.			
			Discuss the significance of electrophysiologic studies imaging and other investigations in epilepsy.			
			Describe briefly about pharmacologic treatment.			
	CSF formation, circulation and functions		Describe regulation of cerebral blood flow	1	LGF	MCQs Viva
			Describe formation, flow, and absorption of cerebrospinal fluid			
			Describe Blood–Cerebrospinal Fluid and Blood-Brain Barriers			
LAB WORK						
	Examination of sensations		Examine the sensations (tactile, position, pain, thermal, vibration) of lower limb on a standardized patient	2	Lab Practical	OSPE Viva
	Examination of deep tendon reflexes-1		Examine a standardized patient for deep tendon reflexes of lower limbs	2	Lab Practical	OSPE Viva
	Examination of deep tendon reflexes-2		Examine a standardized patient for upper limbs tendon reflexes	2	Lab Practical	OSPE Viva
	Examination of motor functions of the brain and spinal cord		Examine a standardized patient for power, tone and movements of upper and lower limbs, speech, memory and other higher cortical functions	2	Lab Practical	OSPE Viva
	Examination of		Illicit cerebellar signs in a	2	Lab	OSPE

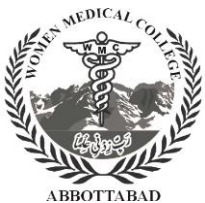


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	cerebellum		standardized patient		Practical	Viva
	Neurological examination of upper and lower limbs		Examine a standardized patient for neurological system of upper and lower limbs	2	Lab Practical	OSPE Viva

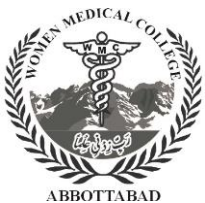
SPECIAL SENSES MODULE

Class	Topic	Module	Learning Outcomes	TeachingHours	Mod e of Tea chin g	Assess ment Tools
2nd Yr MBB S	Sense of smell		Describe olfactory membrane	1	LGF	MCQs Viva
			Explain mechanism of excitation of the olfactory cells.			
			Discuss Rapid Adaptation of Olfactory Sensations.			
			Define threshold for smell			
			Describe transmission of smell signals into the central nervous system	1	SGF	MCQs Viva
			Describe primitive and newer olfactory pathways into the central nervous system			
			Describe centrifugal control of activity in the olfactory bulb by the central nervous system.			
		Sense of Taste		Discuss primary sensations of taste	1	LGF



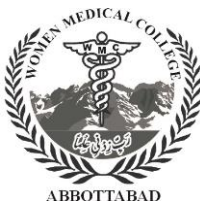
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			Explain threshold for taste			
			Describe the taste bud and its function			MCQs Viva
			Describe mechanism of stimulation of taste buds	1	SGF	MCQs Viva
			Describe transmission of taste signals into the central nervous system			MCQs Viva
	Physical Principles of Optics		Describe refraction at interface between two media.	1	LGF	MCQs Viva
			Describe the physical principles of optics.			
			Apply refractive principles to lenses			
			Describe Focal Length of a Lens			
			Explain formation of image by convex lenses	1	LGF	MCQs Viva
			Explain how to measure refractive power of a lens			
	Optics of The Eye		Explain lens system of the eye.	1	LGF	MCQs Viva
			Describe the concept of "Reduced" Eye.			
			Explain accommodation reflex.	1	SGF	MCQs Viva



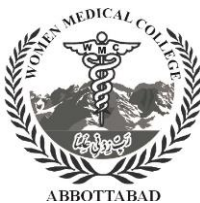
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			Explain presbyopia			
			Describe that “depth of focus” of the lens system increases with decreasing pupillary diameter	1	SGF	MCQs Viva
			Define visual acuity.			
			Explain the determination of distance of an object from the eye- —“DEPTH PERCEPTION”			
			Describe errors of refraction	1	LGF	MCQs Viva
	Fluid System of The Eye— Intraocular Fluid		Describe the formation of aqueous humor by the ciliary body	1	LGF	MCQs Viva
			Describe the outflow of aqueous humor from the eye			
			Describe Regulation of Intraocular Pressure and Glaucoma			
	Anatomy and Function of The Structural Elements of The Retina		Describe foveal region of the retina and its importance in acute vision.	1	SGF	MCQs Viva
			Discuss the functional parts of the Rods and Cones.			
			Describe blood supply of the retina—the central retinal artery and the choroid	1	SGF	MCQs Viva
	Photochemistry of Vision		Explain rhodopsin-retinal visual cycle and excitation of the rods	1	LGF	MCQs Viva



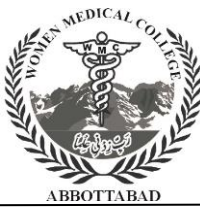
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			Explain the role of vitamin A for formation of rhodopsin.			
			Describe excitation of the rod when rhodopsin is activated by light			
			Describe receptor potential, and logarithmic relation of the receptor potential to light intensity	1	LGF	MCQs Viva
			Describe mechanism by which rhodopsin decomposition decreases membrane sodium conductance—the excitation “cascade.”			
			Explain dark and light adaptation.	1	LGF	MCQs Viva
	Color Vision		Describe photochemistry of color vision by the cones	1	LGF	MCQs Viva
			Explain tricolor mechanism of color detection			
			Explain Young-Helmholtz theory of color vision.			
			Explain color blindness.			
	Neural Function of The Retina		Describe different neuronal cell types and their functions	1	LGF	MCQs Viva
			Describe the visual pathway from the cones to the ganglion cells			
			Discuss the retinal neurotransmitters.			
			Discuss retinal ganglion cells and their respective fields			
			Describe lateral inhibition.	1	SGF	MCQs Viva
			Explain excitation of			



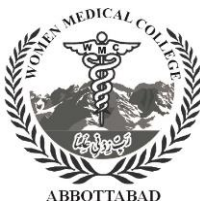
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			ganglion cells. Discuss on and off response of ganglion cells.			
	Visual Pathways		Discuss the function of the dorsal lateral geniculate nucleus of the thalamus.	1	LGF	MCQs Viva
			Describe organization and function of the visual cortex			
			Describe primary visual cortex.	1	SGF	MCQs Viva
			Describe secondary visual areas of the cortex.			
			Describe two major pathways for analysis of visual information: (1) the fast “position” and “motion” pathway and (2) the accurate color pathway	1	SGF	MCQs Viva
			Describe neuronal patterns of stimulation during analysis of the visual image	1	SGF	MCQs Viva
			Discuss detection of color			
	Eye Movements and Their Control		Describe muscular control of eye movements.	1	LGF	MCQs Viva
			Describe neural pathways for control of eye movements.			
			Describe fixation movements of the eyes			
			Explain mechanism of involuntary locking fixation—role of the superior colliculi.	1	SGF	MCQs Viva
			Explain “Fusion” of the visual images from the two eyes			
			Describe neural			



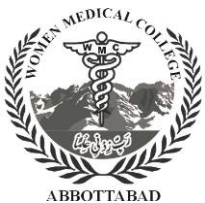
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			mechanism of stereopsis for judging distances of visual objects			
	Autonomic control of Accommodation and pupillary aperture		Describe autonomic nerves to the eyes	1	LGF	MCQs Viva
			Describe control of accommodation			
			Describe control of pupillary diameter	1	SGF	MCQs Viva
			Discuss Pupillary reflexes or reactions in central nervous system disease.			
	Tympanic Membrane and The Ossicular system		Explain conduction of sound from the tympanic membrane to the cochlea.	1	LGF	MCQs Viva
			Describe “Impedance Matching” by the Ossicular System.			
			Describe attenuation of sound by contraction of the tensor tympani and stapedius muscles.	1	SGF	MCQs Viva
			Describe transmission of sound through bone.			
	Cochlea		Describe functional anatomy of the cochlea	1	LGF	MCQs Viva
			Describe basilar membrane and resonance in the cochlea.			
			Describe transmission of sound waves in the cochlea—“traveling wave”			
			Describe pattern of vibration of the basilar membrane for different sound frequencies.			
			Describe amplitude pattern of vibration of the			



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			basilar membrane.			
			Describe function of the organ of corti	1	LGF	MCQs Viva
			Describe Excitation of the Hair Cells			
			Discuss the “place” principle			
			Describe detection of changes in loudness—the power law.	1	SGF	MCQs Viva
			Describe threshold for hearing sound at different frequencies.			
	Auditory Nervous Pathways		Describe auditory pathway.	1	LGF	MCQs Viva
			Explain the function of the cerebral cortex in hearing.			
			Describe how to determine the direction from which sounds come.			
			Describe transmission of centrifugal signals from CNS to lower auditory centers	1	SGF	MCQs Viva
			Describe different types of deafness.			
	Vestibular Sensations and Maintenance of Equilibrium		Describe the physiologic anatomy of vestibular apparatus	1	LGF	MCQs Viva
			Describe function of the utricle and saccule in the maintenance of static equilibrium			
			Describe function of semi-circular ducts	1	SGF	MCQs Viva
			Describe Neuronal Connections of the Vestibular Apparatus			
			Describe Vestibular mechanism for			

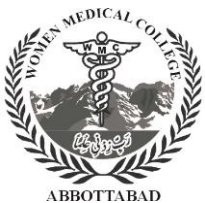


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			stabilizing the eyes		
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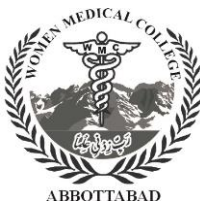
LAB PRACTICALS					
	Examination of Cranial nerves, V, VII		Examine the cranial nerves V & VII on a standardized patient	2	OSPE VIVA
	Examination of Cranial nerves XI, XII		Examine a standardized patient for Cranial nerves XI, XII	2	OSPE VIVA
	Examination of Cranial nerves I, IX, X		Examine a standardized patient for cranial nerve I, IX, X examination (sense of smell, taste, gag reflex)	2	OSPE VIVA
	Visual Acuity		Examine a standardized patient for visual acuity and errors of refraction	2	OSPE VIVA
	Perimetry		Examine a standardized patient for visual field function	2	OSPE VIVA
	Examination of Cranial Nerves III, IV and VI		Examine a standardized patient for oculomotor, Abducens and Trochlear nerves with an ophthalmoscope	2	OSPE VIVA
	Tuning fork test		Examine a standardized patient for hearing loss with tuning fork (Weber and Rinne`s test)	2	OSPE VIVA
	Audiometry		Examine a standardized patient for functions of inner ear	2	OSPE VIVA

GIT MODULE



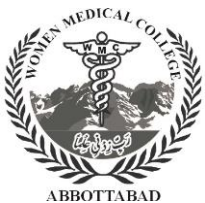
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S.No.	Class	Topic	Module	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1- Painful swallowing							
1	2 ND year MBBS	General principles of gastrointestinal motility	GIT	<p>Describe electrical activity of gastrointestinal smooth muscle</p> <p>Describe the mechanism of excitation of smooth muscle of gastrointestinal</p> <p>Differentiate between slow wave and spike potential</p>	1	LGF	Summative Assessment MCQ
2		Neural control of GIT function (Enteric Nervous system)		<p>Differentiate between mesenteric and submucosal plexus.</p> <p>Classify the following enteric nervous system neurotransmitters as excitatory or inhibitory: norepinephrine, acetylcholine, CCK, VIP, histamine, and somatostatin</p> <p>Describe the role of autonomic nervous system in regulation of GIT's function</p> <p>Differentiate between sympathetic and parasympathetic modulation of the enteric nervous system and the effector organs of the GI tract</p> <p>Describe three types of gastrointestinal</p>	1	LGF	Summative Assessment MCQ



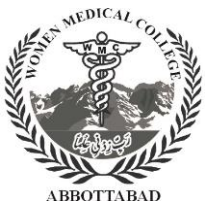
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				reflexes			
3		Hormonal control of Gastrointestinal motility		Describe gastrointestinal hormone actions, stimuli for secretion, and site of secretion	1	LGF SGF	Summative Assessment MCQ
4		Functional types of movements in the gastrointestinal tract		Describe the functional types of movements in the gastrointestinal tract Describe law of gut. Describe blood flow through the villus and its significance	1	LGF	Summative Assessment MCQ
5		Gastrointestinal blood flow— Splanchnic circulation		Describe anatomy of the gastrointestinal blood supply Describe the effect of gut activity and metabolic factors on gastrointestinal blood flow Describe nervous control of gastrointestinal blood flow	1	LGF SGF	
6		Ingestion of food		Describe the mechanics of ingestion of food Describe chewing and mastication Describe different stages of swallowing. Describe the effects of the pharyngeal stage of swallowing on respiration	1	LGF	
7		General principles of alimentary tract		Describe basic mechanisms of stimulation of the	1	LGF	



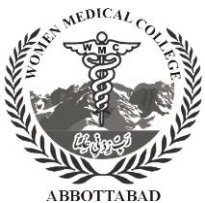
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		secretion		alimentary tract glands Describe dual effect of sympathetic stimulation on alimentary tract glandular secretion			
8		Role of mucus and saliva		Describe the secretion of saliva and its nervous regulation Describe the plasma and saliva concentrations of Na ⁺ , Cl ⁻ , and HCO ₃ ⁻ at low secretion rates and at high secretion rates and the principal cell types involved in each secretion rate. State the substrates and digestion products of salivary amylase (ptyalin). Identify the stimuli and cell types involved in GI secretion of mucous, and identify the function of salivary mucus. Describe three types of stimuli that increase salivary secretion. State the components of the saliva important in oral hygiene, and identify the role of salivary secretions in eliminating heavy metals	1	LGF SGF	
9		Disorders of swallowing and esophagus		Describe the clinical abnormalities of swallowing mechanism	1	LGF	



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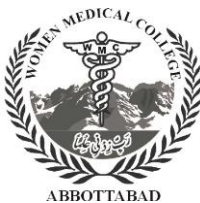
				Describe Achalasia and Megaesophagus			
2- Pain Epigastrium							
10		Motor function of Stomach	GIT	Describe the motor function of stomach. Describe basic electrical rhythm of the stomach wall Describe Pyloric pump Describe role of the pylorus in controlling stomach emptying Describe the regulation of gastric emptying	1	LGF SGF	Summative Assessment MCQ
11		Gastric secretion		Describe characteristics of the gastric secretions Describe the mechanism of secretion of different gastric glands Describe the phases and regulation of gastric secretion. Enlist the hormones that inhibit and increase gastric secretions. Enumerate the reflexes that inhibit and increase gastric secretions	1	LGF SGF	



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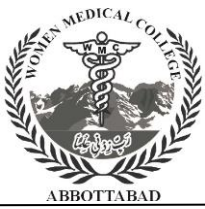
3- Jaundice

12		Pancreatic secretion	GIT	Describe the role of pancreatic secretions in digestion. Describe the phases and regulation of pancreatic secretion	1	LGF SGF	Summative Assessment MCQ
13		Physiology of liver		Describe Physiological Anatomy of the Liver Describe blood flow through the liver Describe metabolic functions of liver Describe Regulation of Liver Mass—Regeneration Describe Bilirubin formation and excretion	1	LGF	Summative Assessment MCQ
14		Secretion of bile by liver		Describe the mechanism of secretion of bile by the liver Describe the function of bile salts in fat digestion and absorption Describe functions of the biliary tree in digestion	1	LGF SGF	Summative Assessment MCQ



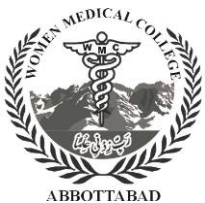
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4: Diarrhoea and Constipation				
15	Movements of the small intestine	Describe different types of movements of small intestine. Describe the control of peristalsis by nervous and hormonal signals	1	Summative Assessment MCQ
16	Secretion of small intestine	Describe secretion of mucus by Brunner's glands in the duodenum	1	
17	Pancreatic enzymes	Describe the chemistry, secretion, functions and regulation of pancreatic enzymes	1	
18	Intestinal digestive enzymes	Describe the chemistry, secretion, functions and regulation of small intestinal digestive enzymes Describe secretion of intestinal digestive juices by the crypts of lieberkühn	1	
19	Gastrointestinal hormones	Describe the secretion, structure, functions and regulation of Gastrin, Secretin, Cholecystokinin and other GI hormones	1	
20	Disorders of small intestine	Describe abnormal digestion of food in the small intestine in pancreatic failure Describe malabsorption by the small intestinal mucosa in Sprue	1	
5: Bleeding Per Rectum				



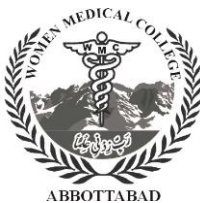
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21	Movements of the Colon	Describe different ty Describe gastro-colic re Describe the mechr
22	Secretion of Large Intestine	Describe secretion of
23	Disorders of Large intestine	Describe con Explain mechanism of diarrh Explain paralysis of defectio
24	General Disorders of the gastrointestinal tract	Describe the mechanisms o Describe Vomiting Act Describe Gastrointestinal OI Describe gases in the gastro



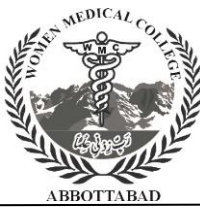
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RENAL MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1. Loin pain/Flank pain					
1	Physiological Anatomy Of the kidneys and Overview of its Functions	<p>States major functions of the kidneys & brief physiological anatomy of kidney.</p> <p>Define the components of the nephron and their interrelationships: renal corpuscle, glomerulus, nephron, and collecting-duct system.</p> <p>Draw the relationship between glomerulus, Bowman's capsule, and the proximal tubule.</p> <p>Describe the 3 layers separating the lumen of the glomerular capillaries and Bowman's space; defines podocytes, foot processes, and slit diaphragms.</p> <p>Define glomerular mesangial cells and states their functions and location within the glomerulus.</p> <p>Detail of renal vessels & Pressure within them.</p> <p>Describe, in general</p>	2	LGF	Summative Assessment MCQ



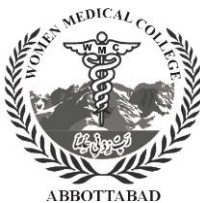
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		<p>terms, the differences among superficial cortical, midcortical, and juxtamedullary nephrons. List the individual tubular segments in order; states the segments that comprise the proximal tubule, Henle's loop, and the collecting-duct system; defines principal cells and intercalated cells.</p> <p>Define juxtaglomerular apparatus and describes its 3 cell types; states the function of the granular cells.</p> <p>Define the basic renal processes: glomerular filtration, tubular reabsorption, and tubular secretion</p>			
2	Glomerular Filtration: Determinants and Equation	<p>Describe how molecular size and electrical charge determine filterability of plasma solutes; states how protein binding of a low molecular-weight substance influences its filterability.</p> <p>State the formula for the determinants of glomerular filtration rate, and states, in qualitative terms why the net filtration</p>	2	LGF SGF	Summative Assessment MCQ



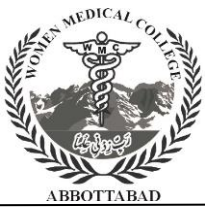
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		<p>pressure is positive. Define filtration coefficient and states how mesangial cells might alter the filtration coefficient; states the reason glomerular filtration rate is so large relative to filtration across other capillaries in the body. Describe how arterial pressure, afferent arteriolar resistance, and efferent arteriolar resistance influence glomerular capillary pressure.</p> <p>Describe how changes in renal plasma flow influence average glomerular capillary oncotic pressure.</p> <p>State the Starling forces involved in capillary filtration. State how changes in each Starling force affect glomerular filtration rate</p>			
3	Nervous & Hormonal Control of Renal Circulation	<p>Define renal blood flow, renal plasma flow, glomerular filtration rate, and filtration fraction, and gives normal values.</p> <p>State the formula relating flow, pressure, and resistance in an organ.</p>	2	LGF SGF	Summative Assessment MCQ



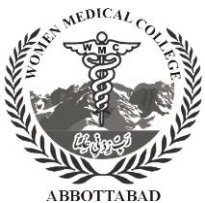
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		<p>Describe sympathetic nerve supply of renal vessels & hormones affecting renal vessels</p> <p>Describe the effects of changes in afferent and efferent arteriolar resistances on renal blood flow</p>			
4	Auto regulation of GFR and renal blood flow	<p>Define auto regulation of renal blood flow and glomerular filtration rate</p> <p>Describe the myogenic and tubuloglomerular feedback mechanisms of auto regulation.</p>	2	LGF SGF	Summative Assessment MCQ
5	Review of Transport Mechanisms across the Cell Membrane(Active and Passive transport)	<p>Define and state the major characteristics of diffusion, facilitated diffusion, primary active transport, secondary active transport (including symport and antiport) and endocytosis.</p> <p>Define osmolality and osmolarity, and states why osmolarity is commonly used to approximate osmolality.</p> <p>Describe what is meant by the expression "water follows the osmoles."</p>	2	LGF SGF	Summative Assessment MCQ



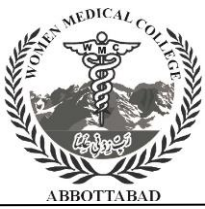
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		<p>Describe qualitatively the forces that determine movement of reabsorbed fluid from the interstitium into peritubular capillaries.</p> <p>Compare the Starling forces governing glomerular filtration with those governing peritubular capillary absorption.</p> <p>Compare and contrasts the concepts of Tm and gradient-limited transport.</p> <p>Describe 3 processes that can produce bidirectional transport of a substance in a single tubular segment; states the consequences of pump-leak systems.</p> <p>Contrast "tight" and "leaky" epithelia.</p>			
2 Edema and Urinary retention/ Scanty Urine					
6	Body fluid compartments	<p>List the body fluid compartments</p> <p>Recall the volumes of body fluid compartments</p> <p>Discuss the interplay in fluid volumes between different fluid compartments</p> <p>Describes principles of osmosis and</p>	2	LGF SGF	Summative Assessment MCQ



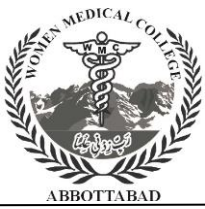
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		<p>osmotic pressure</p> <p>Discuss the interplay between various pressures.</p> <p>Discuss principles of edema • Intracellular fluid compartment • Extracellular fluid compartment</p> <ul style="list-style-type: none"> • Intravascular fluids • Blood • Plasma • Interstitial fluid • Constituents of intra- and extracellular fluid compartments • Calculating fluid volumes • Osmosis and osmotic fluid regulation 			
7	Reabsorption /Secretion along Different Parts of the Nephron	<p>List approximate percentages of sodium reabsorbed in major tubular segments.</p> <p>List approximate percentages of water reabsorbed in major tubular segments.</p> <p>Define the term iso-osmotic volume reabsorption</p> <p>Describe proximal tubule sodium reabsorption, including the functions of the apical membrane</p>	3	LGF SGF	Summative Assessment MCQ



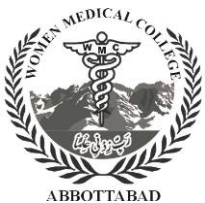
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		<p>sodium entry mechanisms and the basolateral sodium-potassium-adenosine triphosphatase.</p> <p>Explain why chloride reabsorption is coupled with sodium reabsorption, and lists the major pathways of proximal tubule chloride reabsorption. State the maximum and minimum values of urine osmolality.</p> <p>Define osmotic diuresis and water diuresis.</p> <p>Explain why there is an obligatory water loss</p> <p>Describe the handling of sodium by the descending and ascending limbs, distal tubule, and collecting-duct system. Describe the role of sodium-potassium-2 chloride symporters in the thick ascending limb.</p> <p>Describe the handling of water by descending and ascending limbs, distal tubule, and collecting duct system</p>			
8	mechanisms of regulation of tubular	Discuss the mechanisms of	2	LGF	Summative Assessment MCQ



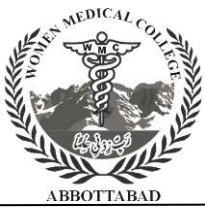
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	reabsorption	<p>regulation of tubular reabsorption</p> <ul style="list-style-type: none"> •Reabsorption and secretion by the renal tubules •Active and passive transport mechanisms •Mechanism of reabsorption of specific substances (eg. <ul style="list-style-type: none"> •Water, electrolytes) •Reabsorption and secretion in different parts of the tubules •Glomerular balance •Peritubular and renal interstitial fluid physical forces •Effect of arterial pressure on urine output •Hormonal control of tubular reabsorption <ul style="list-style-type: none"> •Aldosterone •Angiotensin-II •ADH •Parathyroid hormone •Nervous regulation of tubular reabsorption 			
9	Concept Of Renal Clearance	<p>Define the terms clearance and metabolic clearance rate, and differentiates between general clearance and renal clearance. List the information required for clearance calculation .</p> <p>State the criteria that</p>	2	LGF	Summative Assessment MCQ



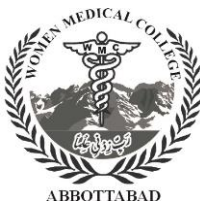
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		<p>must be met for a substance so that its clearance can be used as a measure of glomerular filtration rate; states which substances are used to measure glomerular filtration rate and effective renal plasma flow. Predict whether a substance undergoes net reabsorption or net secretion by comparing its clearance with that of inulin or by comparing its rate of filtration with its rate of excretion.</p> <p>Calculate net rate of reabsorption or secretion for any substance.</p> <p>Calculate fractional excretion of any substance.</p> <p>Describe how to estimate glomerular filtration rate from CCr and describes the limitations.</p> <p>Describe how to use plasma concentrations of urea and creatinine as indicators of changes in glomerular filtration rate.</p>			
10	Mechanism of diluted	Describe the process of "separating salt	1	LGF	Summative



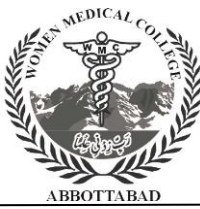
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	urine formation	<p>from water" and how this permits excretion of either concentrated or dilute urine.</p> <p>Describe how antidiuretic hormone affects water reabsorption.</p> <p>Describe the characteristics of the medullary osmotic gradient. Explain the role of the thick ascending limb, urea recycling, and medullary blood flow in generating the medullary osmotic gradient.</p> <p>State why the medullary osmotic gradient is partially "washed out" during a water diuresis</p> <p>Describe the origin of antidiuretic hormone and the 2 major reflex controls of its secretion; define diabetes insipidus; state the effect of antidiuretic hormone on arterioles.</p> <p>Distinguish between the reflex changes that occur when an individual has suffered iso-osmotic fluid loss because of diarrhoea as opposed to a pure water loss (ie, solute-water loss as</p>			Assessment MCQ
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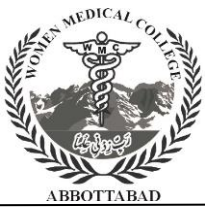
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		<p>opposed to purewater loss).</p> <p>Describe the control of thirst. Describe the pathways by which sodium and water excretion are altered in response to sweating, diarrhoea, haemorrhage, high-salt diet, and low-salt diet</p>			
11	Mechanism of concentrated urine formation	Discuss the mechanism of concentrated urine formation	3	LGF	Summative Assessment MCQ
12	Renal regulation of Potassium	<p>State the normal balance and distribution of potassium within different body compartments, including cells and extracellular fluid.</p> <p>Describe how potassium moves between cells and the extracellular fluid, and how, on a short-term basis, the movement protects the extracellular fluid from large changes in potassium concentration.</p> <p>Describe how plasma levels of potassium do not always reflect the status of total-body potassium.</p> <p>State generalizations about renal</p>	2	LGF	Summative Assessment MCQ



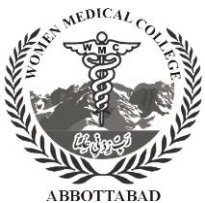
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		<p>potassium handling for persons on high- or low-potassium diets.</p> <p>State the relative amounts of potassium reabsorbed by the proximal tubule and thick ascending limb of Henle's loop regardless of the state of potassium intake.</p> <p>Describe how the cortical collecting duct can manifest net secretion or reabsorption; describes the role of principal cells and intercalated cells in these processes.</p> <p>List the 3 inputs that control the rate of potassium secretion by the cortical collecting duct.</p> <p>Describe the mechanism by which changes in potassium balance influence aldosterone secretion.</p> <p>State the effects of most diuretic drugs and osmotic diuretics on potassium excretion.</p> <p>Describe the association between perturbations in acid-base status and the</p>			
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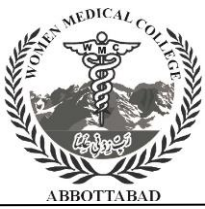
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		plasma potassium level			
13	The prostate	Discuss the physiological functions of the prostate	1	LGF	Summative Assessment MCQ
14	physiochemical aspects	Discuss the physiochemical aspects (Diffusion, Adsorption, Viscosity, Colloid Osmotic pressure and role of Albumin in regulation of Osmotic pressure)	1	LGF	Summative Assessment MCQ
15	Regulation of extracellular fluid osmolality and sodium concentration	<p>Discuss the homeostatic function of the kidneys</p> <p>Explain the mechanism by which kidneys are able to form diluted or concentrated urine</p> <p>Describe Mechanism of formation of dilute urine</p> <p>Describe Mechanism of formation of concentrated urine</p> <p>Describe requirements for excreting a concentrated urine</p> <p>Describe the counter-current mechanism</p> <p>Describe Role of distal tubules and collecting ducts</p> <p>Describe Quantifying urine concentration and dilution</p> <p>Describe Disorders of urine</p>	2	LGF	Summative Assessment MCQ



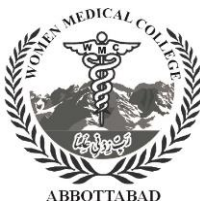
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		concentration ability			
16	Regulation of extracellular fluid osmolarity and sodium concentration-2	<p>Discuss the homeostatic function of the kidneys</p> <p>Discuss the principles of osmoregulation by the kidneys Explain how the body regulated the osmolarity of fluid comparts</p> <p>Describe Control of extracellular fluid osmolarity and sodium concentration</p> <p>Describe Osmoreceptor-ADH feedback system</p> <p>Describe Role of thirst in controlling extracellular fluid osmolarity and concentration</p> <p>Describe Salt-appetite mechanism and Integrated response to sodium intake</p>	2	LGF	Summative Assessment MCQ
17	Regulation of concentration of potassium, calcium, phosphate and magnesium	<p>Discuss the mechanisms of regulation of concentrations of various ions in the body</p> <p>Describe the processes occurring at cellular level to maintain/excrete various ions in the kidneys</p> <p>-Regulation of</p>	1	LGF SGF	Summative Assessment MCQ



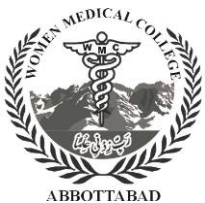
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		<p>potassium</p> <p>--Regulation of calcium</p> <p>-Regulation of phosphate</p> <p>-Regulation of magnesium</p>			
18	Short and Long term control of Blood pressure by Kidney	<p>Describe the 3 temporal domains of blood pressure control and the major mechanisms associated with them.</p> <p>Describe the relationship between renin and angiotensin II.</p> <p>Describe the 3 detectors that can alter renin secretion.</p> <p>Define pressure natriuresis and diuresis.</p> <p>Define tubuloglomerular feedback and describe the mechanism for tubuloglomerular feedback and auto regulation of glomerular filtration rate</p>	2	LGF SGF	Summative Assessment MCQ
3 Urinary incontinence					
19	Urinary bladder and micturition	<p>Describe the functional anatomy of urinary bladder</p> <p>Explain the mechanism of micturition</p>	2	LGF	Summative Assessment MCQ



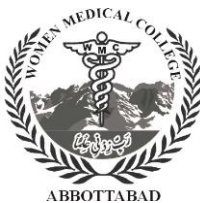
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		<p>Explain the micturition reflex and relate structures of the bladder with function</p> <p>Explain basal cystometrogram</p> <p>Describe the nervous control of bladder functions</p>			
20	Urinary incontinence	<p>Discuss the causes, symptoms and management of patients with urinary incontinence, urgency, frequency, burning micturition etc</p> <p>Causes of urinary incontinence, urgency, frequency, burning micturition</p> <p>Terms related to urinary obstruction and incontinence</p> <p>Describe Clinical presentation of continence disorders. Explain General management of incontinence</p>	1	LGF	Summative Assessment MCQ
ENDOCRINOLOGY MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
Theme-1 (Tall stature)					
1	Introduction to endocrinology	Describe the chemical messengers in the body Describe the classification of hormones	2	LGF	Summative Assessment MCQ



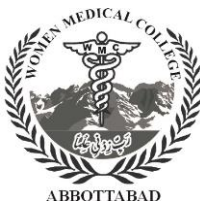
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		Describe mechanisms of synthesis of hormones Describe mechanisms of hormone Secretion, Transport and Clearance from the Blood			
2	Mechanisms of Action of Hormones	Explain mechanisms of Action of Hormones Describe second messenger mechanisms for mediating intracellular hormonal functions Describe measurement of Hormone Concentrations in the Blood	2	LGF SGF	Summative Assessment MCQ
3	Pituitary gland Physiological anatomy and its control	Describe physiological anatomy of pituitary gland Describe hypothalamus Control of Pituitary Secretion	1	LGF SGF	Summative Assessment MCQ
4	Physiological Functions of Growth Hormone	Describe Growth hormone's effect on growth and metabolism Explain the structure, mechanism of action and physiological effects of Insulin-Like Growth Factors Describe regulation	2	LGF SGF	Summative Assessment MCQ



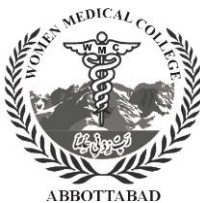
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		of Growth Hormone			
5	Physiological Functions of Posterior Pituitary hormones	Describe formation and physiological functions of Oxytocin Describe formation and physiological functions of ADH	1	LGF SGF	Summative Assessment MCQ
Theme-2 (Neck swelling with bulging eyes and Tetany)					
6	Introduction of thyroid hormones	Describe formation, Secretion and transport of thyroid hormones Explain mechanism of action of thyroid hormones Explain the actions of thyroid hormones on cellular metabolism	1	LGF SGF	Summative Assessment MCQ
7	Physiological functions & regulation of thyroid hormone	Describe Physiological effects of Thyroid Hormone on Growth, metabolism and body systems Describe Regulation of Thyroid Hormone Secretion	2	LGF SGF	Summative Assessment MCQ
8	Physiological functions and Control of the Parathyroid hormone	Explain Mechanism of action PTH Describe Effect of Parathyroid Hormone on Calcium and Phosphate concentrations Describe Control of Parathyroid Secretion	1	LGF	Summative Assessment MCQ
9	Physiological role of	Explain Role of Vit. D	1	LGF	Summative



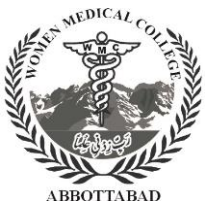
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	VIT D and Calcitonin in Calcium metabolism	in Calcium and phosphorus metabolism Explain physiological functions of calcitonin			Assessment MCQ
Theme-3 (Increased thirst and urination)					
10	Mechanism of action of insulin & its control	Explain Mechanism of action of insulin Describe the Control of Insulin Secretion	1	LGF	Summative Assessment MCQ
11	Physiological Effects of insulin on carbohydrates, protein, and Fats	Describe the effects of insulin on carbohydrates, proteins and Fats metabolism	2	LGF	Summative Assessment MCQ
12	Physiology of Glucagon	Describe regulation of glucagon and its effects Describe the physiological actions of Somatostatins	1	LGF	Summative Assessment MCQ
13	Physiological effects of Diabetes Mellitus	Describe Effects of hyperglycaemia /hypoglycaemia on body functions	1	LGF	Summative Assessment MCQ
Theme-4 (Moon face)					
14	Physiological functions of Aldosterone	Describe Types, Mechanisms and regulation of mineralocorticoids Describe the physiological Effects of Aldosterone (Renal, Circulatory and others)	1	LGF	Summative Assessment MCQ
15	Physiological Functions of the Glucocorticoids	Describe Types and Mechanisms of Glucocorticoids actions	2	LGF SGF	Summative Assessment MCQ



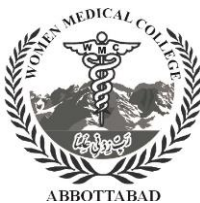
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		Describe Effects of Cortisol on Carbohydrate, Proteins and Fat Metabolism Describe role of Cortisol in Stress, Inflammation and Allergy			
16	Physiological functions Adrenocorticotrophic Hormone ACTH	Describe ACTH Secretion & mechanism of Action	1	LGF	Summative Assessment MCQ
MODULE REPRODUCTION					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
Theme-1 (Pregnancy and child birth)					
1	Overview of Reproductive System	Describe the spermatogenesis Explain the function of prostate gland Describe the composition of semen	1	LGF	Summative Assessment MCQ
2	Functions of Testosterone	Relate the functions of testosterone with its secretion and metabolism Describe the intracellular mechanism of action of testosterone Relate the control of secretion of testosterone with its congenital and acquired abnormalities	1	LGF SGF	Summative Assessment MCQ
3	Hormonal cyclical changes of Female	Describe the monthly ovarian cycle	2	LGF SGF	Summative Assessment MCQ



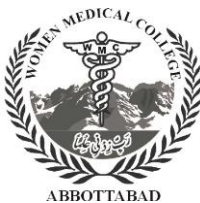
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	reproductive system	<p>Describe the effects of gonadotropic hormones on the ovaries.</p> <p>Describe the functions of estrogens</p> <p>Describe the functions of progesterone</p> <p>Explain monthly endometrial cycle</p> <p>Describe the role of hypothalamic and Pituitary ovarian system in controlling the female hormones</p> <p>Define puberty, menarche and menopause.</p> <p>Enumerate the changes produced in puberty</p>			
4	Physiological changes in Pregnancy	<p>Describe the transport of fertilization ovum in the fallopian in the uterus.</p> <p>Explain the effects of HCG in causing persistence in pregnancy</p> <p>Describe the secretion of estrogen and progesterone by placenta</p> <p>Describe the functions of HCS</p> <p>Describe the maternal changes in pregnancy</p>	1	LGF SGF	Summative Assessment MCQ



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		Describe the changes in maternal circulatory system during pregnancy. Describe the development of breast during pregnancy			
5	Parturition	Explain the process of parturition and involution of the uterus after parturition	1	LGF	Summative Assessment MCQ
6	Milk production	Explain the functions of prolactin Describe the ejection or "let down" of milk. Explain the composition of milk	1	LGF	Summative Assessment MCQ
7	Problems of prematurity	Describe Growth and Functional Development of the Fetus Describe adjustments of the newborn to Extra Uterine Life Discuss Special Functional Problems in the Neonates	1	LGF SGF	Summative Assessment MCQ
Theme-2 (Infertility)					
8	Male sex hormones	Describe the structure, secretion, mechanism of action, physiological actions and regulation of Testosterone Describe the hormonal changes occurring in puberty	1	LGF	Summative Assessment MCQ

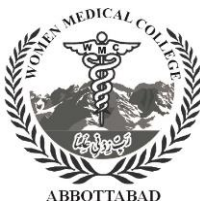


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		in males and female			
9	Female sex hormones	Describe the structure, secretion, mechanism of action, physiological actions and regulation of Estrogen and Progesterone	2	LGF	Summative Assessment MCQ
LAB PRACTICAL					
1.	Pregnancy Test	Understand the basis of pregnancy test Perform the pregnancy test by using pregnancy test kit and urine sample provided in the laboratory.	02	Practical	OSPE Viva

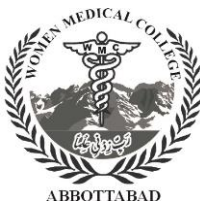
Objectives & Learning Strategies/TOS:

BLOOD AND IMMUNOLOGY-II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1.	Red blood cells	Discuss the steps of Erythropoiesis Correlate red cell indices with its clinical implications	01	LGF	MCQ Viva
2.	White blood cells	Classify white blood cells Discuss disorders of white blood cells	01	LGF	MCQ Viva
3.	Platelets	Enumerate the causes of thrombocytopenia Explain intrinsic and extrinsic pathways of coagulation	01	LGF	MCQ Viva
MSK - II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools



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1.	Physiological characteristics of MSK	Discuss important physiological characteristics of musculoskeletal system	01	LGF	MCQ Viva
CVS-II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1.	Cardiac Cycle	Outline major events in cardiac cycle Discuss physiology of heart sounds and murmurs	01	LGF	MCQ Viva
RESPIRATORY - II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1.	Ventilation of lungs	Describe the mechanics of ventilation Discuss different lung volumes and capacities Describe respiratory gas exchange	01	LGF	MCQ Viva
RENAL - II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1.	GFR Absorption of water and solutes	Describe GFR, determinants of GFR and its estimation Describe absorption of water and solutes along different segments of nephron	01	LGF	MCQ Viva
ENDOCRINE & REPRODUCTION - II MODULE					
S.No.	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
1.	Thyroid gland	Explain the gross and microscopic structure of thyroid gland Explain the synthesis, functions and regulation of thyroid gland	01	LGF	MCQ Viva
2.	Adrenal gland	Explain the gross and microscopic structure of adrenal gland Explain the synthesis, functions and regulation of adrenal gland	01	LGF	MCQ Viva



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Learning Resources:

Sr. No	Text/ Reference Books	Edition
1.	Guyton and Hall, Text Book of Medical Physiology	14 th
2.	Ganong's Review of Medical Physiology	23 rd
3.	Lauralee Sherwood, Human Physiology	8 th

Additional Learning Resources:

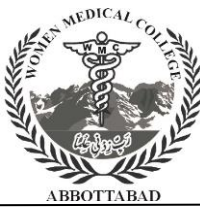
Hands on	
Skills Lab	
Videos	
Internet Resources	

Assessment Methods:

- MCQs: Multiple Choice questions; Single best Type
- OSPE/OSCE: Objective Structured Practical/Clinical Examination
- Presentation:

Multiple Choice Questions:

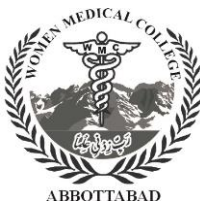
1. Single best type MCQs having five options with one correct answer and four distractors are part of assessment.
2. Correct answer carries one mark, and incorrect will be marked zero. Rule of negative marking is not applicable.
3. Students mark their responses on specified computer-based designed sheet.



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Objective Structured Practical/Clinical Examination

1. OSPE/OSCE stations are used for formative as well as summative assessment.
2. Time allocated for each station is five minutes as per Examination rules of Khyber Medical University, Peshawar.
3. All students are rotated through the same stations.
4. Stations used are unobserved, observed, interactive and rest stations.
5. On unobserved stations, models, lab reports, radiographs, flowcharts, case scenarios may be used to assess cognitive domain.
6. On observed station, examiners don't interact with candidate and just observe the performance of skills /procedures.
7. On interactive station, examiner ask questions related to the task within the allocated time.
8. On rest station, students are not given any task. They just wait to move to the next station.



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Presentation:

Students are given topics for presentation either individually or in groups. They are encouraged to prepare presentations on power point to enhance their understanding of the topic.

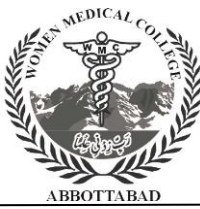
Internal Assessment Criteria:

1. Internal Assessment of each block according to the policy of Khyber Medical University is given below.

Total Marks	Paper A = 14	Paper D = 14	Paper G = 14
	Paper B = 13	Paper E = 13	Paper H = 13
	Paper C = 13	Paper F = 13	Paper I = 13
Total Marks	Paper J = 13	Paper L = 14	
	Paper K = 13	Paper M = 13	

This Internal Assessment will comprise of following components

- a) Attendance
- b) Block Examination Results
- c) Logbooks
- d) Short Cases (in case 5th Year MBBS)
- e) Long Cases (in case 5th Year MBBS)
- f) Ward Tests (in case 5th Year MBBS)



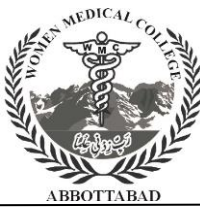
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Examination Rules & Regulations:

1. Exam Cell conducts the End of Module and Block Assessments according to the blueprint provided by the Khyber Medical University, marks of which will be included in internal assessment.
2. The minimum passing marks in each subject shall be 50% in theory and practical. A student who fails in theory or practical examination of a subject shall be considered to have failed in the subject.
3. No student is eligible for university examination without attending at least 75% of lecturers, demonstrations, tutorials, and practical/clinical work in both in-patient and out-patient departments in that academic session.

Feedback on Examination:

1. Students' feedback on assessment strategies will be taken in a preformed proforma for feedback at the end of the session.
2. Department of Medical Education & Quality Enhancement Cell in collaboration with Exam Cell of WDC is responsible to conduct this exercise.



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Model Questions:

Multiple Choice Question

MCQ

1. **Which of the following shifts the oxy-hemoglobin dissociation curve to the left?**
 - a) ↑ed pH.*
 - b) ↑ed temperature.
 - c) ↑ed 2,3-diphosphoglycerate.
 - d) ↑ed H⁺ ions.
 - e) ↑ed CO₂.

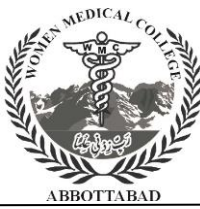
2. **A 11 year old boy presented to the OPD with fever and paleness. He is found to have a parasitic worm infection. An increase in which blood cells would confirm this?**
 - a) Eosinophils.*
 - b) Basophils.
 - c) Red blood cells.
 - d) Platelets.
 - e) Lymphocytes.

3. **Lysosomes contain:**
 - a) Lipases.
 - b) Oxidases.
 - c) Hydrolases*
 - d) Elastases
 - e) Peroxidases

4. **Weight lifting can result in a dramatic increase in skeletal muscle mass. This increase in muscle mass is primarily attributable to which of the following?**
 - a) Fusion of sarcomeres between adjacent myofibrils
 - b) Hypertrophy of individual muscle fibers*
 - c) Increase in skeletal muscle blood supply
 - d) Increase in the number of motor neurons
 - e) Increase in the number of neuromuscular junctions

5. **Critinism is characterized by**
 - a) Failure of mental growth*
 - b) Excessive bone growth
 - c) Exophthalmos
 - d) Hyperglycemic attacks
 - e) Lack of sleep

6. **Biopsies are taken from the antral and duodenal mucosa of a 55 years old woman. Which of the following hormones can be found in tissue homogenates from both locations?**
 - i. Cholecystokinin (CCK)
 - ii. Gastrin*
 - iii. Glucose-dependent insulintropic peptide (GLIP)
 - iv. Motilin
 - v. Secretin



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7. A 39-year-old neurosurgeon picks up a scalpel, which activates numerous sensory receptors in her hand. An increase in which of the following best describes the basis for transduction of the sensory stimuli into nerve impulses?
- a) Activation of G protein
 - b) Decreased ion permeability
 - c) Decreased transmitter release
 - d) Increased ion permeability*
 - e) Increased transmitter release

Suggestions for Next Academic Year:

The curriculum provided by KMU is well prepared but the teaching hours for each module is not specified by KMU. There should be standardized distribution of teaching hours for each module, followed strictly in all institutes.

Prepared By: Physiology department