Contents:

STUDY GUIDE

2nd Year BDS

General Pathology and Microbiology

Description:

Overview

Program	Bachelor of Dental surgery
Course Name	General Pathology and Microbiology
Contact Hours	210 hrs
Infrastructure Requirements	Lecture hall, labs

Faculty Responsible For Course Conduction:

Sr.no	Faculty	Designation
01	Dr. Sara Ali Jadoon	HOD
02	D. Summayia Yousaf	Lecturer
03	Dr. Sidra Khan	Lecturer

Details of Supporting Staff:

Sr.no	Staff	Designation
01	Mr Kashif Khan	Lab Tech.
02	Mr Faisal Khan	Computer operator
03	Miss Nadia Rani	Lab Asst.
04	Mr. Altaf	Office Boy

Objectives & Learning Strategies/TOS:

Sr.no	Topic	Learning Outcomes	Teaching Hours	Mode of Teaching	Assessment Tools
01	**Cell injury, Cell death and adaptations**	Upon completion of this section of Pathology, the student shall be able to;	10hr	LGF	MCQs & SEQs
	Introduction to Pathology Cellular Housekeeping	Define pathology- Describe the structure of Plasma Membrane, structure and function of Endoplasmic Reticulum, Golgi, Lysosomes,Proteasomes -Describe the Cellular Metabolism along with mitochondrial function	1 hr	LGF	MCQs& SEQs
	Cellular Activation. Maintaining Cell Populations	Describe Cell Signaling and its mechanism Enlist various types Growth Factors and Receptors with their function. Explain the Proliferation and the Cell Cycle along with role of inhibitors and inducers	1hr	LGF	MCQs& SEQs
	Overview: Cellular Responses to Stress and Noxious Stimuli	Enlist the Stages of the cellular response to stress and injurious stimuli. -	1hr	LGF	MCQs& SEQs
	Adaptations of Cellular Growth And differentiation	Enlist the types of cellular adaptations - Describe the mechanism of hypertrophy with	1hr	LGF	MCQs& SEQs

		examples -Describe the mechanism of hyperplasia with examples -Describe the mechanism of atrophy with examples -Describe the mechanism of metaplasia with examples			
	Overview of Cell Injury and Cell death -	Enlist various Causes of Cell Injury -Describe the mechanism of Reversible Injury -Define Necrosis -Describe various Patterns of Tissue Necrosis	1hr	LGF	MCQs& SEQs
	Mechanisms of Cell Injury	Describe the mechanism of Oxidative Stress in the cell and the injury caused by it -	1hr	LGF	MCQs& SEQs
	Clinicopathologic Correlations	Describe the defects in membrane permeability -Describe the damage to DNA and proteins Describe the mechanism of Ischemic and Hypoxic Injury - Describe the mechanisms of ischemic cell injury -Describe the Ischemia- Reperfusion Injury -Describe the Chemical (Toxic) Injury to cell			
	Apoptosis Causes of Apoptosis	Define Apoptosis	1hr	LGF	MCQs& SEQs
	Morphologic and Biochemical	Describe the process of apoptosis in physiologic situations -Describe the apoptosis in pathologic conditions			

	Changes in Apoptosis Clinicopathologic Correlations: Apoptosis in Health and Disease	Describe 1.The Intrinsic (Mitochondrial) Pathway of Apoptosis 2. The Extrinsic (Death Receptor-Initiated) Pathway of Apoptosis Describe the the execution phase of apoptosis -Describe the process of removal of dead cells Describe the examples of apoptosis -Describe the disorders associated with dysregulated apoptosis -Describe the process of heterophagy and autophagy - Describe the process of Necroptosis with examples			
	Intracellular Accumulations	-Describe the pathogenesis and morphology of following intracellular accumulations 1. Lipids Steatosis (Fatty Change) 2. Cholesterol and Cholesterol Esters 3. Proteins 4. Hyaline Change 5. Glycogen	1hr	LGF	MCQs& SEQs
	Pigments	Enlist the types of exogenous pigments and endogenous pigments -Describe the morphological features of various types of pigments	1hr	LGF	MCQs& SEQs
	Pathologic Calcification	Describe the pathogenesis, and	1hr	LGF	MCQs& SEQs

		morphology of Dystrophic Calcification -Describe the pathogenesis, and morphology of Metastatic Calcification -Describe the etiology of Cellular Aging and cellular senescence			
02	**Inflammation**	Upon completion of this section of Pathology, the student shall be able to;	10hr	LGF	MCQs &SEQs
	Overview of Inflammation: Definitions and General Features	Enlist and briefly describe Causes of Inflammation -Explain and Illustrate the Recognition of Microbes and Damaged Cells	1hr	LGF	MCQs& SEQs
	Acute Inflammation	Describe the reactions of blood vessels in acute inflammation -Describe the changes in vascular flow and caliber -Explain mechanism of increased vascular permeability (Vascular Leakage) - Describe the responses of lymphatic vessels and lymph nodes	1hr	LGF	MCQs& SEQs
	Leukocyte Recruitment to Sites of Inflammation	Describe the mechanism of leukocyte adhesion to endothelium -Describe the mechanism of leukocyte migration through endothelium - Describe the mechanism of chemotaxis of leukocytes	1hr	LGF	MCQs& SEQs

	Phagocytosis	Describe the mechanism of Phagocytosis -Describe the role of Intracellular destruction of microbes and debris -Define Neutrophil Extracellular Traps -Describe the Leukocyte-mediated tissue injury and associated defects	1hr	LGF	MCQs& SEQs
	Mediators of Inflammation	Describe the role and source of mediators; 1. Vasoactive Amines: Histamine and Serotonin 2. Arachidonic Acid Metabolites 3. Cytokines and Chemokines 4. Complement System	1hr	LGF	MCQs& SEQs
	Morphologic Patterns of Acute Inflammation Outcomes of Acute Inflammation	Explain the morphological pattern and example of Serous Inflammation -Explain the morphological pattern and example of Fibrinous, Purulent (Suppurative), Abscess, ulcer Summarize the events of Acute Inflammation	1hr	LGF	MCQs& SEQs
	Chronic Inflammation	-Enlist the Causes of Chronic Inflammation -Describe the morphologic features of chronic inflammation	1hr	LGF	MCQs& SEQs
	Cells and Mediators of Chronic	Explain the role of	1hr	LGF	MCQs& SEQs

	Inflammation	macrophages in chronic inflammation -Explain the role of Role of Lymphocytes - Enumerate the other cells in chronic inflammation			
	Granulomatous Inflammation	Describe the etiology, pathogenesis and morphology of granuloma	1hr	LGF	MCQs& SEQs
	Systemic Effects of Inflammation	-Enumerate the systemic effects of inflammation	1hr	LGF	MCQs& SEQs
03	**Tissue Repair, Regeneration, Healing**	Upon completion of this section of Pathology, the student shall be able to;	05hr	LGF	MCQs& SEQs
	Overview of Tissue Repair	-Describe the control mechanisms in cell proliferation -Describe the Mechanisms of Tissue Regeneration Enumerate the Steps in Scar Formation -	1hr	LGF	MCQs& SEQs
	Repair by Connective Tissue Deposition, Granulation tissue	Describe the process of angiogenesis -Explain the Deposition of Connective Tissue in tissue remodeling - Describe the components of granulation tissue	1hr	LGF	MCQs& SEQs
	Selected Clinical Examples of Tissue Repair and fibrosis	-Describe Healing of Skin Wounds both primary and secondary - Explain mechanism of Fibrosis in Parenchymal Organs	1hr	LGF	MCQs& SEQs

	Factors That Influence Tissue Repair	Enumerate all local and systemic factors for tissue repair	1hr	LGF	MCQs& SEQs
	Abnormalities in Tissue Repair	-Describe the formation of keloid ad hypertrophic scar - Describe the formation of exuberant formation and desmoids	1hr	LGF	MCQs& SEQs
04	**Hemodynamic disorders Thromboembolic Disease and shock**	Upon completion of this section of Pathology, the student shall be able to;	08hr	LGF	MCQs& SEQs
	Edema and Effusions	-Discuss the causes of increased hydrostatic pressures -Discuss the causes of reduced plasma osmotic pressures Discuss the causes of sodium and water retention -Discuss the causes of lymphatic obstruction Identify pathophysiological categories of Edema - Explain the morphology and clinical features of Edema	1hr	LGF	MCQs& SEQs
	Hyperemia and Congestion	Explain the differences of the terms hyperemia and congestion morphologically	1hr	LGF	MCQs& SEQs
	Hemostasis, Hemorrhagic disorders	-Define the term Hemostasis and explain the sequence of events leading to hemostasis Relate the role of platelets in maintaining	1hr	LGF	MCQs& SEQs

		hemostasis -Revise the coagulation cascade -Discuss in detail the significance of Endothelium in maintaining Hemostasis			
	Thrombosis	-Explain the etiology, pathogenesis and morphology of thrombosis -Discuss the effects of endothelial injury -Describe in detail the effects of alternations in normal blood flow -Associate hypercoagulability with thrombus formation -Discuss in detail the fate of thrombus	1hr	LGF	MCQs& SEQs
	Embolism	-Discuss the etiology, pathogenesis and morphology of pulmonary embolism -Discuss the etiology, pathogenesis and morphology of systemic thromboembolism , fat and marrow embolism, air embolism , amniotic fluid embolism	1hr	LGF	MCQs& SEQs
	Infarction	-Explain the mechanism of infarction -Discuss the factors that lead to development of infarct and its morphology	1hr	LGF	MCQs& SEQs
	DIC	Explain the process of Disseminated intravascular coagulation -Discuss the	1hr	LGF	MCQs& SEQs

		pathophysiology and morphology of DIC			
	Shock	-Discuss the pathogenesis of septic shock -Describe all stages of shock, morphology and clinical Consequences	1hr	LGF	MCQs& SEQs
05	**Genetics**	Upon completion of this section of Pathology, the student shall be able to;	04hr	LGF	MCQs& SEQs
	Genes and human diseases	-Discuss in detail mutations -Define Mendelian disorders -Discuss the transmission patterns of autosomal dominant disorders -Discuss the transmission patterns of autosomal recessive disorders -Discuss the transmission patterns of X-linked disorders	1hr	LGF	MCQs& SEQs
	Biochemical and molecular basis basis of single gene disorders	Discuss the enzyme defects and their consequences with example (lysosomal and glycogen storage diseases) -Discuss the disorders of structural proteins (Marfan Syndrome, EDS) -Discuss the defects in receptors and transport system with example (familial hypercholesterolemia) - Review of alteration in structure, function or quantity of nonenzymic	1hr	LGF	MCQs& SEQs

		proteins -Review of genetically determined adverse reaction to drugs			
	Chromosomal Disorders	-Discuss cytogenetic disorders involving autosomes (down syndrome) and sex chromosomes (Klinefelter Syndrome, Turner syndrome) -	1hr	LGF	MCQs& SEQs
	Molecular Genetics Diagnosis	-Explain the diagnostic methods (PCR, FISH, MLPA) -Discuss polymorphic markers and molecular diagnosis, RNA Analysis	1hr	LGF	MCQs& SEQs
06	**Neoplasia**	Upon completion of this section of Pathology, the student shall be able to;	14hr	LGF	MCQs& SEQs
	Nomenclature	Explain the terms differentiation and anaplasia -Explain the terms local invasion and metastasis -Explain pathways of spread of tumors	2hr	LGF	MCQs& SEQs
	Characteristics of tumor	-Discuss features of benign and malignant neoplasms -Differences of benign and malignant neoplasms	2hr	LGF	MCQs& SEQs
	Epidemiology of cancer	-Discuss the global impact of cancer - Discuss the role of environmental factors in development of cancer -	2hr	LGF	MCQs& SEQs

		Discuss in detail age, acquired predisposing conditions -Explain the genetic predisposition and interaction between inherited and environmental factors			
	Molecular basis of cancer	-Discuss role of genetic and epigenetic alterations -Describe cellular and molecular hallmarks of cancer - Explain the self-sufficiency in growth signals -Describe the terms, ONCOGENES, PROTOONCOGENES, ONCOPROTEINS - Explain the insensitivity to growth inhibition - Explain the growth promoting metabolic alterations -Explain warburg effect -Discuss in detail the evasion of programmed cell death (APOPOTOSIS) Associate limitless replicative potential with tumor growth -Explain the role of angiogenesis, invasion and metastasis in development of tumor -Discuss the evasion of host defense, genomic instability Illustrate with examples cancer enabling inflammation -Discuss dysregulation of cancer associated gene (chromosomal changes,	2hr	LGF	MCQs& SEQs

		epigenetic changes and noncoding RNA's)			
	Carcinogenic Agents. Role of chemical carcinogenesis and steps involved in development of cancer	-Describe direct acting carcinogens -Describe indirect acting carcinogens -Explain the role of radiation carcinogenesis (uv RAYS, IONIZING RADIATION) -Discuss the microbial carcinogenesis	2hr	LGF	MCQs & SEQs
	Clinical Aspects of Neoplasia	-Paraneoplastic syndromes Explain the grading and staging of tumors --	2hr	LGF	MCQs & SEQs
	Laboratory diagnosis	Discuss laboratory diagnosis of cancer Explain the tumor markers in detail	2hr	LGF	MCQs & SEQs
07	**Immunity**	Upon completion of this section of Pathology, the student shall be able to;	13hr	LGF	MCQs & SEQs
	Introduction and cells of immune system	Define immunology - Enumerate cell of immune system - Difference between innate and adaptive immune system	1hr	LGF	MCQs & SEQs
	Cell mediated immunity	-Describe cell mediated immunity -Discuss Maturation and education of T and B cells -Enumerate their functions	1hr	LGF	MCQs & SEQs
	Humoral immunity	-Define and describe humoral immunity - Enlist Different types of antibodies and discuss -	1hr	LGF	MCQs & SEQs

		Functions of humoral immunity			
	Cells and cytokines	-Enlist cell involved in innate and adaptive immune system -Briefly describe role of different cytokines in immunology	1hr	LGF	MCQs & SEQs
	Hypersensitivity Reactions	-Define hypersensitivity reaction -Enlist Different types of hypersensitivity reactions -Discuss Differentiation between different reactions - Briefly discuss	2hr	LGF	MCQs & SEQs
	Complement System	Laboratory diagnosis -Define is complement system -Discuss Different pathways of complement system - Describe Functions of complement system - Briefly review Clinical implications of complement system	1hr	LGF	MCQs & SEQs
	Immune tolerance &	-Define immune tolerance -Enlist diff. Mechanisms involved in immune tolerance -	1hr	LGF	MCQs & SEQs
	Autoimmunity	Discuss Pathophysiology of autoimmunity - Enumerate Different autoimmune diseases - Discuss Diagnosis of autoimmune diseases	1hr	LGF	MCQs & SEQs
	Major Histocompatibility Complex	-Describe MHC - Enumerate Different types and structure - Briefly classes Role of MHC	1hr	LGF	MCQs & SEQs
	Antigen and Antibody Reaction	-Give brief Introduction & Salient Features of Antigen – Antibody	1hr	LGF	MCQs & SEQs

		Reaction.			
	Immunodeficiency disorders	-Define immunodeficiency disorders -Classify immunodeficiency disease -Discuss Manifestations Etiology & AIDS	1hr	LGF	MCQs & SEQs
	Transplantation & graft rejection.	-Discuss different types of grafts. -Briefly discuss pathogenesis of different types of graft rejection -Discuss the measures to prevent graft rejection	1hr	LGF	MCQs & SEQs
08	**General Bacteriology**	Upon completion of this section of Pathology, the student shall be able to;	12hr	LGF	MCQs & SEQs
	Introduction	Discuss important features of microbes - Describe characteristics of prokaryotic and eukaryotic cells	1hr	LGF	MCQs & SEQs
	Structure of bacteria	-Discuss shape and size of bacteria -Discuss cell wall and its components -Compare cell wall of gram positive and gram negative -Describe bacterial spores and their importance - Discuss cytoplasmic structure and its components	1hr	LGF	MCQs & SEQs
	Growth	-Define Binary fission - Discuss growth cycle and curve and its phases -Discuss aerobic and anaerobic growth -	1hr	LGF	MCQs & SEQs

		Discuss fermentation and iron metabolism			
	Bacterial Genetics	-Define genetics -Discuss mutation and its types -Discuss transfer of DNA within bacterial cell -Discuss transfer of DNA between bacterial cell -Discuss recombination and its types	1hr	LGF	MCQs & SEQs
	Classification of important bacteria	-Discuss principles of classification -Classify bacteria on different basis	1hr	LGF	MCQs & SEQs
	Normal flora	-Define normal flora Enlist normal flora with their anatomical sites -Discuss medical importance of normal flora -Define commensals, carrier state, colonization and resistance	1hr	LGF	MCQs & SEQs
	Pathogenesis	-Define pathogen, virulence, infectious dose, parasite and types -Describe types of bacterial infections -Enlist stages of bacterial infection -Discuss determinants of bacteria -Enumerate different strains of bacteria causing disease	2hr	LGF	MCQs & SEQs
	Host Defense	-Define innate and acquired immunity -Describe host defenses against bacteria -Describe components of acquired and innate immunity	1hr	LGF	MCQs & SEQs
	Laboratory diagnosis of bacteria	-Discuss approach to	1hr	LGF	MCQs & SEQs

		laboratory work - Discuss approach to serological testing - Describe specimen taking for different cultures -Discuss commonly used bacterial agars -Discuss different methods of diagnosis based on nucleic acid analysis			
	Bacterial vaccine	-Enlist general principles of bacterial vaccines - Describe active and passive immunity -Enlist common bacterial vaccine	1hr	LGF	MCQs & SEQs
	Sterilization and Disinfection	-Define sterilization and disinfection -Discuss methods of sterilization and disinfection - Identify instruments /agents/machine used in sterilization	1hr	LGF	MCQs & SEQs
09	**Special bacteriology**	Upon completion of this section of Pathology, the student shall be able to;	22hr	LGF	MCQs & SEQs
	Gram positive cocci Staphylococcus;Staph aureus Staph epidermidis, Staph saprophyticus	Classify Streptococci & Staphylococci	1hr	LGF	MCQs & SEQs
	Streptococcus; Strep pyogenes, Strep pneumonia, Strp agalctiae, Strep viridans, Enterococci	Discuss features, transmission, pathogenesis, diagnosis, prevention	2hr	LGF	MCQs & SEQs
	Gram positive rods Spore-forming; Bacillus anthracis, Bacillus cereus Clostridium tetani, botulinum, perfringens, difficile Non-spore forming; Cornybacterium diphtheria,	Classify gram positive rods -Discuss features, transmission, pathogenesis, diagnosis, prevention	2hr 2hr	LGF LGF	MCQs & SEQs MCQs & SEQs

	Listeria monocytogenes, Gardnerella vaginalis Filamentous; Actinomyces Israeli, Nocardia spp.				
	Gram negative rods Introduction of Enterobacteriaceae Pathogen both inside and outside enteric Tract; E.coli,Salmonella	-Discuss features, transmission, pathogenesis, diagnosis, prevention	2hr	LGF	MCQs & SEQs
	Pathogens within the enteric tract Shigella,compylobacter, helicobacter, Vibrio cholera, parahae molyticus, vulnificus		2hr	LGF	MCQs & SEQs
	Pathogens outside the enteric tract Klebsilla, Enterobacter, Serratia group, Proteus, Providencia morganella group Pseudomonas, Bacteroides & Prevotella	-Discuss features, transmission, pathogenesis, diagnosis, prevention	1hr	LGF	MCQs & SEQs
	Gram negative rods related to respiratory tract; Haemophilus, Bordetella, Legionella, Acinetobacter	Discuss features, transmission, pathogenesis, diagnosis, prevention	2hr	LGF	MCQs & SEQs
	Gram negative rods related to animal source Brucella, Francisella, Pasteurella,Barton ella		2hr	LGF	MCQs & SEQs
	Anaerobes	Discuss anaerobic infections	1hr	LGF	MCQs & SEQs
	Mycobacterium; Mycobacterium tuberculosis Atypical mycobacteria, Mycobacterium leprae	Discuss features, transmission, pathogenesis, diagnosis, prevention	2hr	LGF	MCQs & SEQs
	Mycoplasma Pneumonia	-Discuss features,	1hr	LGF	MCQs & SEQs

	Spirochetes; Treponema, Leptospira, Borrelia burgdorferi, B. recurrentis,	transmission, pathogenesis, diagnosis, prevention			
	Chlamydiae; Chlaymydia trachnomatis, C. pneumoniae, C. psittaci	-Discuss features, transmission, pathogenesis, diagnosis, prevention	1hr	LGF	MCQs & SEQs
	Rickettsiae; Rickettsia rickettsii,prowazekii Coxiella burnetii	-Discuss features, transmission, pathogenesis, diagnosis, prevention	1hr	LGF	MCQs & SEQs
10	**Virology**	Upon completion of this section of Pathology, the student shall be able to;	05hr	LGF	MCQs & SEQs
	Introduction	Discuss important properties -Enlist comparison of viruses and cell	1hr	LGF	MCQs & SEQs
	Structure of virus	-Discuss shape and size of virus -Discuss different component of virus			
	Classification of virus	-Discuss principle of classification - Enumerate classification of virus			
	DNA viruses; Herpesvirus Herpes simplex virus Varicella-Zoster virus Cytomegalovirus Epstein-barr virus Human herpesvirus 8 Smallpox, Adenovirus Papillomavirus Parvovirus	-Discuss features, transmission, pathogenesis, diagnosis, prevention	1hr	LGF	MCQs & SEQs
	RNA enveloped virus; Orthomyxoviruses Influenza virus Parainfluenza virus - Paramyxoviruses Measles virus Mumps virus Respiratory syncytial virus Togavirus Rubella	-Discuss features, transmission, pathogenesis, diagnosis, prevention	1hr	LGF	MCQs & SEQs

	virus Rhabdovirus Rabies virus Human T-cell Lymphotropic virus Filoviruses Ebola virus Hepatitis virus; HAV, HBV, HCV, HDV, HEV Arbovirus; Dengue virus, Yellow fever, Chikungunya virus HIV	 -Discuss features, transmission, pathogenesis, diagnosis, prevention -Discuss features, transmission, pathogenesis, diagnosis, prevention	 1hr 1hr	 LGF LGF	 MCQs & SEQs MCQs & SEQs
11	**Mycology** Introduction Cutaneous and subcutaneous mycoses; Dermatophytosis , tinea nigra Tinea versicolor Sporotrichosis, chromomycosis Mycetoma Systemic mycoses; Coccidioides, Histoplasma Blastomyces, Paracoccidioides Opportunistic mycoses; Candida, Cryptococcus, Aspergillus, mucor & rhizopus Pnuemocystis Fusarium	Upon completion of this section of Pathology, the student shall be able to; Define mycology - Discuss structure of fungi Compare of Fungai and bacteria -Discuss pathogenesis	2hr	LGF	MCQs & SEQs
12	**Parasitology** Classification Protozoans; Intestinal & Urogenital parasite; Entamoeba, Giardia, cryptosporidium Blood and tissue parasite; Plasmodium, toxoplasma, leishmania Cestodes	Upon completion of this section of Pathology, the student shall be able to; Discuss features, transmission, pathogenesis, diagnosis, prevention	13hr 1hr 2hr 2hr 2hr	LGF LGF LGF LGF LGF	MCQs & SEQs MCQs & SEQs MCQs & SEQs MCQs & SEQs MCQs & SEQs

	Trematodes; Schistosoma, Clonorchis, paragonimus, Fasciola		2hr	LGF	MCQs & SEQs
	Nematodes; Enterobius, trichuris, ascaris, Ancylostoma & nectar Strongyloides,trichinella		2hr	LGF	MCQs & SEQs
	Wucheria,onchocerca,loa, dracunculus medinensis		2hr	LGF	MCQs & SEQs
	Practical work	Upon completion of this section of Pathology, the student shall be able to;	92hrs	Practical	OSPE
	Cellular adapatation; Metaplasia in bronchus, esophagus in acid reflux	Define metaplasia Distinguish its gross and microscopic features	2hr	SGF	OSPE
	Atrophy, Hyperplasia	Define Atrophy, hyperplasia Distinguish its gross and microscopic features	2hr	SGF	OSPE
	Reversible injury; Fatty change in the liver	Define and explain liver steatosis Enumerate its causes Describe its pathophysiology Enlist its types Explain gross and microscopic features on slide	2hr	SGF	OSPE
	Pigmentation Hemosiderin Intacellular accumulations; Inhaled pigments- carbon in lungs (Anthracosis), Degenerative pigment (lipofuscin)	Define pigmentation State its types Define anthrocosis Describe its pathophysiology Classify anthrocosis Enumerate the important features of anthrocosis on gross and microscope	2hr	SGF	OSPE
	Irreversible injury/ Necrosis and its types; Coagulative necrosis in	Define necrosis? Enlist the important features	2hr	SGF	OSPE

	heart (MI) vs Liquifactive necrosis in brain (Stroke) Fat necrosis	of necrosis Elaborate its types Elaborate features of necrosis on slide during microscopy			
	Pathological calcification in pancreas	Define calcification State pathological calcification Elaborate its pathophysiology Elaborate the features of pathological calcification on slide during microscopy	2hr	SGF	OSPE
	Chronic granulomatous inflammation; Tuberculosis-granuloma with caseous necrosis	Define granuloma? Describe granulomatous inflammation Elaborate granulomatous inflammation with types and examples Identify the granulomatous inflammation on slide during microscopy	2hr	SGF	OSPE
	Acute suppurative inflammation; abscess, acute appendicitis	Define acute inflammation Explain its components Enumerate its types	2hr	SGF	OSPE
	Chronic inflammation; Chronic Cholecystitis	Define Chronic inflammation Enumerate its causes and types Identify the chronic inflammation on gross and microscope picture	2hr	SGF	OSPE
	Healing by connective tissue-ulcer-Granulation tissue	Differentiate healing by primary and secondary intention Components of granulation tissue Identify the gross and	2hr	SGF	OSPE

		microscopic picture Define the disorder Explain the causes of disorder Understand outcome			
	Chronic venous congestion	Demonstrate gross and microscopic features Recognize the disorders	2hr	SGF	OSPE
	Infarction	Discuss the cause of infarction Identify the types of infarction Recognize the severe outcome	2hr	SGF	OSPE
	Thrombosis-Arterial vs Venous thrombosis	Identify the gross or microscopic picture Define thrombosis Enumerate the causes Describe the outcome Explain the sites of formation	2hr	SGF	OSPE
	Features of malignant tumor	Identify gross or microscopic picture	2hr	SGF	OSPE
	Benign tumors-Lipoma	Differentiate between benign and malignant tumor Understand the term anaplasia Explain rate of growth Explain metastasis	2hr	SGF	OSPE
	Leiomyoma	Define the term Describe formation Enlist sites of tumor	2hr	SGF	OSPE
	Hemangioma	Discuss gross or microscopic picture	2hr	SGF	OSPE
	Adenoma & Fibroadenoma	Classify types of tumor, occurrence, size of tumor Interpret clinical features gross and microscopic picture Distinguish between benign and malignant tumors Enlist the types	2hr	SGF	OSPE

		Explain gross or microscope picture Identify the site of tumor Describe predisposing factors			
	Squamous cell carcinoma	Enumerate gross and microscopic picture	2hr	SGF	OSPE
	Malignant oral cancer	State the type of carcinoma Recognize its site State its incidence Enumerate its Predisposing factors	2hr	SGF	OSPE
	Basal cell carcinoma	Observe and describe the gross and microscopic picture Identify the type of carcinoma Memorize the site of tumor Enlist predisposing factors Recall growth pattern.	2hr	SGF	OSPE
	Study of Microscope	Observe gross and microscopic picture Identify and understand principal components of light microscope Demonstrate how to set up and use light microscope	2hr	SGF	OSPE
	How to prepare smear	Differentiate two major categories of bacteria	2hr	SGF	OSPE
	Staining of bacteria-Gram stain	Explain how gram stain affects bacteria based on structural differences in their cell wall	2hr	SGF	OSPE
	Staining of bacteria-Ziehl Neelson stain	Differentiate bacteria between acid fast group and non-acid fast group Explain how ZN stain and its acid alcohol deodorizer affects bacteria.	2hr	SGF	OSPE
	Identifying Gram positive cocci-	Test for the enzyme	2hr	SGF	OSPE

	Catalase Test	catalase on your unknown isolates.			
	Identifying Gram positive cocci-Coagulase Test	To identify Staphylococcus aureus that produces the enzyme coagulase, which causes the fibrin of blood plasma to clot.	2hr	SGF	OSPE
	Identification and preparation of Bacteriological Media	Describe the nutritional requirements of bacteria Identify and describe culture media used for growth of bacteria including examples of all purpose media, enriched, differential Define enrichment media. Enlist growth phases of microorganism and different type of growth media available to culture them	2hr	SGF	OSPE
	Antibiotic Sensitivity Test	To utilize specific monitoring techniques to evaluate the susceptibility of a microbe to different antibiotics. To distinguish the range of activity of an antibiotic.	2hr	SGF	OSPE
	Streak Plate Method	Describe aseptic technique, dilution, colony streaking and spread plates for day-to-day experiments Demonstrate the practice to obtain	2hr	SGF	OSPE

		colonies of micro-organisms that are pure. i,e. growth derived from a single cell/spore			
	Methods Of Sterilization	Discuss the rationale for sterilization and disinfection Select appropriate methods of sterilization and disinfection Implement appropriate quality assurance measures.	2hr	SGF	OSPE
	Widal Test	Demonstrate the procedure to detect the presence of serum antibodies Salmonella Typhi and Paratyphi to diagnose enteric fever.	2hr	SGF	OSPE
	Motility of Bacteria	Describe motility of living bacteria Summarize about different methods of motility determination	2hr	SGF	OSPE
	Biochemical test	Reproduce different biochemical reactions to identify bacteria.	2hr	SGF	OSPE
	Collecting and transporting specimen	Analyze and compare different techniques used for the transportation of various forms of specimen	2hr	SGF	OSPE
	Urine Sample Examination for crystals and casts	Enumerate microscopic findings in urine. Distinguish different casts & crystals	2hr	SGF	OSPE
	Stool sample Examination for cysts and ova	Explain macroscopic and microscopic examination of stool.	2hr	SGF	OSPE
	Preparation of blood film	Demonstrate different techniques of blood film and smear preparation	2hr	SGF	OSPE
	Elisa	Analyze different	2hr	SGF	OSPE

		aspects of the procedure			
	Study of Various pathology lab instruments and machines	Analyze different aspects of Laboratory instruments Demonstrate the proper use Summarize the proper care	2hr	SGF	OSPE
	Opportunistic Mycoses	Analyze different structures of candida and other opportunistic fungi under microscope	2hr	SGF	OSPE
	Malarial Parasites	Differentiate between different forms of malarial parasite. Examine different types of malarial parasites in prepared blood smears.	2hr	SGF	OSPE
	Ascariasis	Observe the different stages of life cycle of Ascaris Lumbricoides	2hr	SGF	OSPE
	Amoebiasis	Compare the different stages of life cycle of Entamoeba Histolytica	2hr	SGF	OSPE
	Giardiasis	Categorics the different stages of life cycle of Giardia	2hr	SGF	OSPE
	Cestodes	Analyze the stages of life cycle of different Cestodes	2hr	SGF	OSPE

Learning Resources:

Sr.no	**Text Books**	Edition
01	Robbins & Cotran, Pathologic Basis of Disease	9th edition
02	Rapid Review Pathology by Edward F. Goljan MD	4th edition
03	Review of Medical Microbiology and Immunology by Warren Levinson	15th edition
	Reference Books	
01	Textbook of Pathology, by Harsh Mohan	7th edition

02	Clinical Microbiology Made Ridiculously Simple by Mark Gladwin	8th edition
03	Essentials Of Medical Microbiology by Apurba Sankar Sastry,Sandhya Bhat	3rd edition
04	Fundamentals of Pathology Pathoma by HUSAIN .A SATTAR	1st edition
05	Muir's Textbook of Pathology by CS Herrington	16th edition
06	Pathology secrets. by: Damjanov, Ivan	3rd edition

Additional Learning Resources:

Hands on	The following facilities are available for the students in order to have a good hands-on experience. A multi head microscope with camera and screen facility. Microscopes for individual use. Multiple stations for practice of staining techniques. A vast collection of slides related to microbiology, hematology and histopathology. A 36-inch LED screen used to project slides when required by the facilitator. Two Refrigerators for storage of culture media. g. A designated -20 °C freezer for storage of bacterial strains. Autoclave & Hot air oven (for sterilization purposes) Incubator A distillation apparatus for a continued supply of distilled water in the laboratory.

	Tissue processor Museum Models available in the museum
Skills Lab	Tissue Processing, Staining techniques, Laboratory diagnostic tests, Bacteriological culture techniques
Videos	https://osmosis.org/library/md https://www.lecturio.com/concepts/bacteriology-overview/
Internet	http://site.ebrary.com/lib/hec http://journals.informs.org/ https://www.wmcmis.com/student/login

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 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.

Objective Structure Practical/Clinical Examination:

1. Nine 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, and 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 candidates and just observe the performance of skills/procedures.
7. On interactive station, examiner asks 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.

Presentation:

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

Internal Assessment Criteria:

1. 10% weightage of internal Assessment in professional exam is policy of Khyber Medical University.
2. This internal assessment will comprise of following components
    a. Attendance.
    b. Class presentation.
    c. Monthly tests.
    d. Midterms.
    e. Pre-Prof.

Examination Rules & Regulations:

1. One class test of the subject may be held monthly, marks of which will be included in internal assessment. Marks for class test can vary according to syllabus and teacher's choice.
2. Mid-Term exam comprising 45 MCQs of single best type and 45 marks SEQs will be held in the middle of the session.
3. Pre-prof Exam comprising 45 MCQs and 45 marks SEQs will be conducted at the end of session before prep leaves.
4. The pattern of class tests, Mid-Term & Pre-prof will be same as the Professional Exam taken by Khyber Medical University, Peshawar.
5. OSPEs will be conducted at the end of Mid-Term & Pre-prof Exam.

Short Answer Question:

A chest radiograph of a 37-year-old man with cough, fever, and night sweats since 3 months, showed a 3-cm nodule in the middle lobe of the right lung. Biopsy of nodule showed sharply circumscribed mass with a soft, white cheesy center.
a) Which of the necrosis type has most likely occurred in this nodule? (1)
b) Enumerate four other types of necrosis with one example each (2)
d) Enumerate any 4 differences of apoptosis from necrosis. (2)

Key:

a) Caseous necrosis

b) Coagulative necrosis- myocardial infarction, kidney infarct
Liquefactive necrosis- ischemic infarct in brain, pus
Fat necrosis- acute pancreatitis, breast trauma
Fibrinoid necrosis- immune vasculitis

c)

	Necrosis	**Apoptosis**
Cell size	Swelling	Shrinkage
Plasma membrane	Disrupted	Intact
Nucleus	Pyknosis/ karyorhexis, karyolysis	Fragmentation into nucleosome size fragments

Multiple Choice Question:

Patients with bloodstream infections with Gram-positive bacteria can develop septic shock. Which inflammatory components are present in the envelopes of Gram-positive bacteria?

Options List:

a. Lipid A of Lipopolysaccharide.
b. O-antigen chains of Lipopolysaccharide.
c. pilli
d. Peptidoglycan and teichoic acids.
e. Polysaccharide capsule

Key:

d. Peptidoglycan and teichoic acids.

Suggestions for Next Academic Year:

Provide this study guide to students as their comprehensive academic roadmap and guidance for the upcoming year.

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