



UNIVERSITY MEDICAL
& DENTAL COLLEGE

STUDY GUIDE

BLOCK 2

THEORY

BIOCHEMISTRY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-B-001	Describe the structure of heme and briefly describe the steps of heme synthesis with its regulation.	Structure, Synthesis, and Functions of Hemoglobin
	Explain the metabolism of iron, including its absorption, transport (transferrin), storage (ferritin, hemosiderin), and regulation.	
	How does heme combine with globin to form hemoglobin and enlist the functions of hemoglobin.	
	Enlist the types of hemoglobin along with their percentage and chain composition.	
	Understand the oxygen-binding mechanism of hemoglobin, including the concepts of cooperative binding and allosteric regulation.	
	Describe hemoglobin structure, functions, and oxygen dissociation curve. Include hemoglobinopathies (sickle cell anemia, thalassemia).	
	Explain the significance of HbA1c.	
	Describe the structure and functions of myoglobin; compare and contrast with hemoglobin in terms of oxygen-binding and clinical relevance (MI marker).	
F2-B-002	Define and explain the biochemical basis of porphyria along with its classification.	Porphyria
	Describe the oral and dental manifestations of porphyria, including erythrodontia, photosensitivity, mucosal lesions, and delayed healing.	
F2-B-003	Describe RBC metabolism (glycolysis, pentose phosphate pathway, G6PD deficiency) and role of trace elements (iron, selenium).	Red Blood Cell Metabolism and Energy Pathways
	Explain RBC metabolism, including glycolysis, pentose phosphate pathway, and G6PD deficiency.	
	Describe and outline the steps in hexose monophosphate pathway (HMP) and its significance in RBCs.	

Compare and contrast glycolysis and the HMP shunt.
Explain hemolytic anemia due to pyruvate kinase and glucose 6 phosphate dehydrogenase deficiencies.
Describe vitamins (A, B6, B9, B12, E), their active forms, sources, RDA, biochemical roles, and deficiency manifestations.

ORAL BIOLOGY & TOOTH MORPHOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-OB-001	Describe the composition and functions of dentin and pulp; correlate structural features with clinical conditions.	Pulp-Dentin Complex
F2-OB-002	Explain the structure, functions, and degradation of extracellular matrix in oral tissues.	Extracellular Matrix
F2-OB-003	Describe the process of dentinogenesis.	Dentin
	Differentiate between the three main types of dentin: primary, secondary, and tertiary, and describe their locations and formation.	
	Describe the mechanisms that control dentin mineralization, and differentiate between the pattern of mineralization in mantle dentin and circumpulpal dentin.	
	Explain the processes of secondary and tertiary dentinogenesis, including the stimuli that trigger their formation.	
	Describe the structure and function of dentinal tubules.	
	Differentiate between peritubular and intertubular dentin, and explain their respective compositions and roles.	
	Explain the formation and significance of sclerotic dentin and interglobular dentin.	
	Describe the structural features of dentin, including incremental growth lines and granular layer of Tom's.	
	Describe the cellular contents and zones of the dental pulp.	

F2-OB-004	Discuss the innervation, vascular supply, and lymphatic supply of the dentin-pulp complex.	Pulp
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	Explain the mechanisms of dentin sensitivity, focusing on the hydrodynamic theory.	
	Describe the formation and clinical significance of pulp stones (denticles).	
	Explain the age-related changes that occur in the dentin-pulp complex.	
	Analyze the pulp's cellular response to dental caries and the mechanical trauma of cavity preparation.	
F2-OB-005	Develop a detailed timeline chart illustrating the calcification stages and eruption periods for deciduous and permanent dentition.	Developmental Timeline and Chronology of Dentition
F2-OB-006	Describe the anatomy of the pulp tissue and pulp cavities in teeth.	Pulp Anatomy
F2-OB-007	Explain the age-related morphological and physiological changes occurring in the pulp cavity.	Age-Related Changes in the Pulp

PHARMACOLOGY & THERAPEUTICS

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-Ph-001	Describe drug absorption and factors affecting it. Describe drug distribution, including concepts of volume of distribution and plasma protein binding.	Drug Transport
F2-Ph-002	Describe drug metabolism (biotransformation, first-pass metabolism, phase I and II reactions, enzyme induction & inhibition, clinical relevance).	Drug Metabolism
F2-Ph-003	Describe drug excretion, elimination, and clearance mechanisms (renal, biliary, other routes) and factors affecting them.	Drug Excretion

F2-Ph-004	Define half-life, loading dose, maintenance dose, and steady-state concentration; explain their clinical relevance.	Plasma Half-Life
F2-Ph-005	Define pharmacodynamics: dose-response relationships, graded vs quantal response. Draw dose response curves.	Pharmacodynamics

	Define receptors & describe types of drug receptors, cell signaling and mechanisms of receptor action. Describe the Phenomenon of down regulation and up regulation of receptors	
	Explain Agonist & antagonists with its types. Differentiate between agonists, antagonists, and partial agonists with examples.	
	Define therapeutic index and/or therapeutic window, and explain its clinical significance. Define Median Effective (ED50), Median Toxic (TD50) & Median Lethal Dose (LD50) and its clinical relevance.	
F2-Ph-006	Illustrate various phases of Drug development. Describe Drug Interactions Identify factors that alter drug response (age, genetics, disease, pregnancy). Describe adverse drug reactions and their classification. Define Desensitization, Tachyphylaxis, Tolerance, Resistance, super sensitivity, hypersensitivity, super infection, iatrogenic effect, idiosyncrasy, and give examples.	

GENERAL PATHOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
	Describe intracellular accumulations (lipids, proteins, glycogen, pigments).	Intracellular

F2-Pa-001	Define calcification; differentiate between dystrophic and metastatic calcification.	Accumulations and Calcification
F2-Pa-002	Define pigmentation; describe endogenous (melanin, hemosiderin) and exogenous pigments (carbon, tattoos).	Pigmentation and Amyloidosis
	Define amyloidosis; describe pathogenesis and morphology.	
F2-Pa-003	Define and explain cellular adaptations: atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia.	Cellular Adaptations

F2-Pa-004	Define aging; describe theories of aging and morphological features.	Aging
F2-Pa-005	Define acute and chronic inflammation and enlist cardinal signs.	Inflammation
	Enumerate the differences between acute and chronic inflammation	
F2-Pa-006	Define wound healing (primary vs secondary intention).	Wound healing

MICROBIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-Pa-007	Define microbes and describe their role in health and disease.	Introduction to Microbiology
	Differentiate between prokaryotic and eukaryotic microorganisms.	
	Classify bacteria according to morphology and staining characteristics.	
	Describe bacterial structure, spores, and growth curve.	
	Describe the composition and types of culture media (selective, differential, enrichment).	

	Compare and contrast applications of different culture media used in microbiology and oral diagnostic labs.	
F2-Pa-008	Define aerobic and anaerobic growth and explain fermentation in oral bacteria.	Microbial Physiology and Genetics
	Discuss the role of iron metabolism in bacterial growth and virulence.	
	Define mutation and its types; explain recombination.	
	Discuss DNA transfer within and between bacterial cells (conjugation, transformation, transduction).	
	Explain the mechanisms of bacterial resistance to antibiotics.	

F2-Pa-009	Define sterilization, disinfection, cross infection and antisepsis.	Infection Control in Dentistry
	Describe common methods of sterilization and disinfection (physical and chemical).	
	Explain the application of these methods in dental clinical practice to prevent cross-infection.	
F2-Pa-010	Define normal flora, colonizer, and dysbiosis.	Normal Flora and Host Interaction
	Discuss the normal flora of different body sites, especially the oral cavity and skin.	
	Describe their distribution, beneficial roles, and contribution to opportunistic infections.	
	Define pathogen, pathogenesis, virulence factors, ID ₅₀ , and LD ₅₀ .	
	Identify factors influencing microbial pathogenicity, including host and immune evasion mechanisms.	
	Discuss principles and stages of bacterial pathogenesis.	

F2-Pa-011	Explain determinants of pathogenesis: transmission, adherence, invasion, inflammation, toxin production, immune pathogenesis.	Bacterial Pathogenesis and Virulence
	Discuss the role of biofilm and glycocalyx in infections, particularly dental plaque and chronic oral infections.	
	Enlist different bacterial strains that cause distinct diseases.	
	Define typical stages of an infectious disease.	
F2-Pa-012	Summarize the mechanism of action of major antimicrobial classes (e.g., β -lactams, aminoglycosides).	Antibiotic Agents
	Identify appropriate antibiotic agents for bacterial infections of dental relevance.	
	Explain mechanisms of bacterial resistance and their implications in dental practice.	
F2-Pa-013	Define osteomyelitis and list microorganisms commonly associated with it.	Oral Microbiology

	Discuss Actinomycetes with emphasis on epidemiology, virulence factors, and pathogenesis in cervicofacial infections.	and Related Infections
F2-Pa-014	Describe the structure and classification of viruses (DNA and RNA).	Introduction to Virology
	Explain basic principles of viral replication and its clinical relevance in oral infections.	
F2-Pa-015	Describe the structure and classify fungi.	Mycology

ORAL PATHOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
	Describe developmental disturbances in dentin.	Dentinogene

F2-OP-001	Explain dentinogenesis imperfecta, regional odontodysplasia and dentin dysplasia (clinical, radiographic, histopathological).	sis imperfecta
F2-OP-002	Describe dentinal caries.	Dentinal Caries
DENTAL RADIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-DR-001	Describe the basic principles of dental imaging and its role in diagnosis.	Introduction to Dental Radiology
	Identify the types and indications of conventional radiographs, including periapical, bitewing, and orthopantomogram (OPG).	

PRACTICALS / LAB WORK		
ORAL BIOLOGY & TOOTH MORPHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-OB-008	Draw and label dentin types (primary, secondary, tertiary), tubules, pulp zones, odontoblasts, interglobular dentin, dead tracts, pulp stones.	Dentin & Pulp
	Identify the dentin and pulp radiographically	
	Identify the Dento-enamel junction radiographically	
PHARMACOLOGY & THERAPEUTICS		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-Ph-007	Calculate drug dose & rate of infusion and unit conversions (Posology).	Dose calculation
	Apply dose calculation principles in labs.	

PATHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-Pa-016	Identify cellular adaptations (metaplasia) in pictures.	Microscopic Identification
ORAL PATHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-OP-003	Identify dentinogenesis imperfecta, pulp cavity, and dentin on radiographs.	Dentinogenesis Imperfecta
MICROBIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC

F2-Pa-017	Perform Gram staining on bacterial smears and identify Gram-positive and Gram-negative bacteria & ZN for MTB under the microscope.	Microscopic Identification
F2-Pa-018	Demonstrate appropriate disinfection methods for dental instruments and materials.	Disinfection
F2-Pa-019	Demonstrate appropriate sterilization methods (autoclave, dry heat, & moist heat) for dental instruments.	Sterilization
F2-Pa-020	Identify culture media used in Microbiology laboratory for identification of pathogens (blood agar, chocolate agar, Mc Conkey agar, Nutrient agar, SDA, LJ medium, TSI, Citrate, Urease).	Culture Media
DENTAL RADIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
F2-DR-002	Interpret basic dental radiographs to recognize normal anatomy and general radiological appearances of common pathology (radiolucency, radiopacity, and resorption).	Interpretation of Conventional Radiographs

THEORY

GROSS ANATOMY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-A-001	List the layers of the scalp and describe their anatomical features, including neurovascular supply and lymphatic drainage.	Scalp
	Give anatomical justification of spread of scalp infections, profuse bleeding in superficial scalp lacerations, gaping of scalp wounds	
	Define the routes of spread of infection from scalp to brain	
CF2-A-002	Enlist in tabulated manner the muscles of facial expression, giving their nerve supply and actions.	Face
	Describe the extracranial course, branches, and distribution of the facial nerve.	
	Explain the causes and clinical consequences of damage to the nerve.	
	Describe the vascular supply and lymphatic supply of face.	
	Describe the danger area of face with its clinical significance.	
	Define the routes of spread of infection from face to brain	
CF2-A-003	Define the boundaries and openings of orbital cavity. List the structures traversing these openings.	Eye
	In a tabulated manner enlist the extraocular and intraocular muscles of eyeball and eyelid muscles giving their nerve supply and actions	
	List and define the movements of eyeball with special reference to the axis	
	List the parts of Lacrimal apparatus giving their location and anatomical features. Describe the nerve supply of lacrimal gland	

	Describe the extracranial course, distribution and branches of oculomotor, trochlear and abducent nerves. Describe the location, roots and distribution of ciliary ganglion	
	Give the clinical correlates of nerves supplying the muscles of the eyeball	
	Describe the course and branches of ophthalmic artery mentioning its origin and termination	
	Give the anatomical structure of eyeball emphasizing on its three coats and their neurovascular supply (including optic nerve and central retinal vessels).	
CF2-A-004	Describe the boundaries contents and primary communications of temporal, infratemporal and pterygopalatine fossa	Temporal, Infratemporal and Pterygopalatine fossa
	Describe the location, roots and distribution of pterygopalatine ganglion	
CF2-A-005	Describe the anatomical features and neurovascular supply of external ear	Ear
	Describe the boundaries, contents, neurovascular supply and communications of middle ear cavity	
	Describe the anatomical features of auditory tube.	
	Describe the parts, anatomical features and neurovascular supply of internal ear	
	Describe the course and distribution of vestibulocochlear nerve	
CF2-A-006	Describe the anatomical features and neurovascular supply of external nose	Nose
	Describe the boundaries of nasal cavity (nasal septum, lateral wall, roof and floor) with their anatomical features, olfactory and trigeminal nerve supply, and vascular supply.	
	Discuss the clinical correlates of nose: Epistaxis, Foreign body in the nose.	

CF2-A-007	Identify the paranasal sinuses (maxillary, frontal, ethmoidal, sphenoidal) and describe their location, neurovascular supply, relations, and drainage pathways.	Sinuses
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	Explain the lining and basic functions of the paranasal sinuses.	
	Relate the maxillary sinus to posterior maxillary teeth and discuss its clinical importance in dentistry (e.g., extractions, implants, sinus lift).	
	Discuss the clinical features of sinusitis and its differentiation from odontogenic pain.	
CF2-A-008	Classify fractures of the maxilla based on anatomical patterns (Le Fort classification)	Fractures
	Classify fractures of the mandible based on anatomical regions	

PHYSIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-P-001	Describe the physiological anatomy of a neuron, including its structure and function.	Membrane Potentials and Action Potentials (Nerve)
CF2-P-002	Enlist the neuroglia cells responsible for myelination in Central Nervous System (CNS) & Peripheral Nervous System (PNS)	Myelinated and Unmyelinated Nerve Fibers.
	Enlist the steps of myelination in peripheral nervous system.	
	Define Multiple sclerosis	
CF2-P-003	Explain Nernst potential of Na & K.	Membrane Potentials
	Derive the Nernst equation.	

	Explain the physiological basis of the Goldman equation and write the equation.	
CF2-P-004	Describe the resting membrane potential of a nerve fiber and the role of various ion channels.	Resting membrane potential
	Discuss Role of different channels in calculating Resting membrane potential of a nerve fiber	
CF2-P-005	Define Action potential and ionic basis.	Action Potentials

	Discuss the role of voltage-gated channels in generating action potentials	
	Define threshold stimulus	
	Define the All-or-None Law.	
	Define absolute refractory period, and relative refractory period also mention their physiological basis. Discuss the effects of hypocalcemia on nerve excitability.	
	Explain the mechanism of local anesthetics on nerve excitability	
CF2-P-006	Explain the propagation of action potentials	Propagation of the action potential
	Define Saltatory conduction and its benefits.	
	Explain mechanism of tetany	
CF2-P-007	Describe the physiological anatomy of skeletal muscles	Contraction of Skeletal Muscle
	Describe the structure of Sarcomere	
CF2-P-008	Explain general mechanism of skeletal muscle contraction (walk along theory)	General mechanism of muscle Contraction

CF2-P-009	Define and differentiate isotonic and isometric contraction with 2 examples of each	Characteristics of whole muscle Contraction
	Give physiological basis of tetanization and multiple fiber summation	
	Define a motor unit and explain the mechanism of muscle contraction by illustrating the role of motor units in regulating force and precision of movement.	
	Give physiological basis of Rigor mortis Explain muscle fatigue	

	Describe physiology of muscle contraction, including sliding filament theory, excitation-contraction coupling, neuromuscular junction, end-plate potential, and muscle fatigue.	
CF2-P-010	Describe the types of smooth muscle and explain their functional properties, including the latch phenomenon.	Smooth Muscles

BIOCHEMISTRY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-B-001	Describe the structure, types, biosynthesis, and functions of collagen and elastin, and explain their roles in maintaining the mechanical strength and elasticity of muscle connective tissue.	Biochemistry and Structural Basis of Muscle Function and Integrity
	Identify disorders associated with collagen and elastin defects, particularly those affecting muscle support structures and connective tissue integrity.	
	Explain the composition and function of the extracellular matrix (ECM) in muscle tissue, including the roles of proteoglycans, collagen, fibronectin, and integrins in muscle cell adhesion, signaling, and repair.	
	Explain the structure and basic function of the electron transport chain (ETC) and describe how oxidative phosphorylation generates ATP in muscle cells.	

CF2-B-002	Explain the processes of glycogenesis and glycogenolysis in muscle tissue, including their regulation, the role of key enzymes, and their contribution to ATP production during exercise.	Energy Production in Muscles
	Discuss the role of muscle glycogen as an energy source during different exercise intensities, its depletion and recovery, and how regular exercise influences glycogen storage capacity and muscle adaptation.	
	Describe the ATP-phosphocreatine (ATP-PC) system and its role in providing immediate energy during short-term, high-intensity muscle activity.	
	Differentiate muscle fiber types (Type I, IIa, IIb) based on structure, metabolism, and functional properties.	
CF2-B-003	Describe vitamin C and its active forms, sources, RDA, biochemical roles, and deficiency manifestations.	Vitamins

ORAL BIOLOGY & TOOTH MORPHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-OB-001	Describe the chemical composition of bone.	Bone
	Describe the functions of osteoblasts, osteocytes, and osteoclasts in Bone Formation and Remodeling	
	Describe the process of intramembranous and endochondral ossification	
	Describe the microscopic Structure of Bone: (Osteon, central canal, lamellae, lacunae, canaliculi, and blood vessels).	
	Explain of regulation of bone cell formation	
MICROBIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC

CF2-Pa-001	Define microbial teratogens, Define TORCH infections and identify the impact of maternal infections (TORCH complex) on embryonic development and their dental implications.	Microbial Teratogens
CF2-Pa-002	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Staphylococci.	Staphylococci
CF2-Pa-003	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Mucormycosis	Mucormycosis
CF2-Pa-004	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Streptococci	Streptococci
CF2-Pa-005	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Actinomyces	Actinomyces
CF2-Pa-006	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Corynebacterium diphtheriae	Corynebacterium diphtheriae
CF2-Pa-007	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Porphyromonas	Porphyromonas
CF2-Pa-008	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Fusobacterium	Fusobacterium

CF2-Pa-009	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Candida	Candida
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PRACTICALS / LAB WORK

GROSS ANATOMY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-A-009	Demonstrate and systematically identify major arteries, veins, and nerves on anatomical models or cadaveric dissections; locate their course, branches, and anatomical relations; and correlate their clinical significance with surrounding structures	Surface Anatomy

CF2-A-010	Identify and demonstrate the origin, insertion, nerve supply, and actions of the muscles of facial expression on models or cadaveric specimens	Jaw Muscles
CF2-A-011	Demonstrate surface marking of extracranial branches of the facial nerve and trigeminal nerve in relation to relevant structures, and identify their anatomical pathways and clinical relevance.	Neurovascular Supply of face
ORAL BIOLOGY & TOOTH MORPHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
CF2-OB-002	Draw and label osteoblasts, osteocytes, and osteoclasts and correlate each with its function.	Bone
CF2-OB-003	Draw and label the stages / histological features of intramembranous and endochondral ossification.	Ossification

THEORY		
ANATOMY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
NS-A-001	Enlist various parts of nervous system, identify location of each part of nervous system. Recognize functions of each part of nervous system	Nervous System Overview
NS-A-002	Define neuron and discuss its structure	Neuron
NS-A-003	Classify neurons morphologically and functionally with examples	Neuron Classification
NS-A-004	Discuss components of central and peripheral nervous system	CNS & PNS Overview
NS-A-005	Give the supporting cells in central and peripheral nervous system	Neuroglia
NS-A-006	Define & classify receptors and effectors	Receptors and Effectors

NS-A-007	Highlight major subdivisions of ANS into sympathetic and parasympathetic nervous system with comparison of anatomical differences.	Sympathetic vs. Parasympathetic System
NS-A-008	Enlist all cranial nerves and their distribution.	Cranial Nerves
NS-A-009	Give the classification, structure, and functions of peripheral nerve fibers in a typical spinal nerve.	Spinal Nerve Anatomy
NS-A-010	Define dermatome	Dermatome
NS-A-011	Enlist the parts of the brain. Enumerate their major functions.	Brain Regions & its functions
NS-A-012	Identify the location, extent, coverings, and blood supply of spinal cord	Spinal Cord Overview
NS-A-013	Tabulate nuclear organization at different levels of spinal cord	Spinal Cord Nuclei
NS-A-014	Draw & label the transverse section of spinal cord at mid cervical level showing ascending & descending tracts	Spinal Cord Cross-Section

NS-A-015	Define gray & white matter and differentiate amongst Fasciculus tract & Lemniscus tract	Spinal Cord Gray & White Matter
NS-A-016	Give the external feature of brain stem	Mid brain, Pons, Medulla & its blood supply
NS-A-017	Draw & Label cross-sections of the brainstem at the levels of the midbrain, pons, and medulla	Brainstem Cross Sectional Anatomy
NS-A-018	Discuss the location of cranial nerve nuclei, their functional components, and distribution, and its exit from respective skull foramina.	Cranial Nerve Nuclei and Pathways
NS-A-019	Identify the lobes of cerebellum	Cerebellar Lobes
NS-A-020	Define important clinical correlates, vermis syndrome, ataxia, dysarthria, dysdiadochokinesia, nystagmus, and vertigo.	Cerebellar Clinical Correlates

NS-A-021	Discuss internal structure of cerebral hemisphere (white matter, basal ganglia, lateral ventricle)	Cerebral Hemisphere Structure
NS-A-022	Briefly explain ventricular system (Lateral, 3rd & 4th ventricles)	Ventricular System
NS-A-023	Briefly explain various parts of internal capsule	Internal Capsule
NS-A-024	Draw and label the formation of Circle of Willis	Circle of Willis
NS-A-025	Explain meninges of the brain	Meninges
NS-A-026	Give the location, origin and termination of dural venous sinuses.	Dural Venous Sinuses
NS-A-027	Discuss the important structures associated with the cavernous sinus and its clinical significance in relation to the danger area of the face	Cavernous Sinus
NS-A-028	Discuss the anatomical basis of extradural, subdural and subarachnoid hemorrhages	Intracranial Hemorrhages
NS-A-029	Explain the formation, circulation and absorption of CSF (Cerebrospinal fluid)	CSF Physiology
NS-A-030	Discuss the origin, course, branches and distribution of internal carotid and vertebral artery	Brain Blood Supply

NS-A-031	Enlist the nuclei of thalamus and hypothalamus along with its functions & connections	Thalamus & Hypothalamus Connections
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PHYSIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
	Classify synapse and explain the physiological anatomy of chemical synapse.	
	Elaborate the role of synapse in processing information.	

NS-P-001	Classify the substances that act as neurotransmitters or synaptic transmitters. Enlist functions related to dentistry of each group.	Organization of the Nervous System, Basic Functions of Synapses, and Neurotransmitters
	Define Excitatory and inhibitory postsynaptic potential and explain their mechanism of generation.	
	Explain spatial and temporal summation.	
	Explain the mechanism of synaptic fatigue (its significance) and synaptic delay.	
	Discuss the effects of hypoxia, acidosis and alkalosis on synaptic transmission	
NS-P-002	Define and classify the sensory receptors in the body on the basis of stimuli they detect.	Sensory Receptors, Neuronal Circuits for Processing Information
NS-P-003	Discuss tonic and phasic receptors with 2 to 3 examples of each.	
NS-P-004	Classify the nerve fibers on the basis of diameter and speed of conduction	Receptors Transduction of sensory stimuli into nerve impulses
NS-P-005	Classify somatic sensations.	Somatosensory cortex
	Explain two main ascending pathways (DCML and Anterolateral system) for transmitting sensation to CNS.	
	Enlist sensations carried by dorsal column medial Lemniscal system and Anterolateral Pathway with special reference to Trigeminal sensory system.	

	Trace these pathways from receptors to sensory cortex and compare their features.	
	Give location and functions of Primary somesthetic area and sensory association area of sensory cortex. Name the sensations perceived by these areas.	
	Describe the sensations lost when there is damage to somesthetic areas.	

	Discuss representation of body parts in sensory cortex	
NS-P-006	Tabulate the sensory nerve endings, and anatomical sites of first, second, third order neurons of ascending tracts.	Ascending Tracts
NS-P-007	Trace the descending tracts.	Descending Tracts
NS-P-008	Differentiate clearly between upper and lower motor neuron lesions	UMN vs. LMN Lesions
NS-P-009	Identify the lobes, sulci & gyri	Cerebral Cortex Anatomy
NS-P-010	Describe functional areas of cerebrum	Functional Cortex
NS-P-011	Define and give physiological basis of referred pain with two examples.	Referred Pain & Trigeminal Neuralgia
	Define Trigeminal Neuralgia.	
NS-P-012	Name the motor areas of cerebral cortex and give representation of body parts.	Cortical and Brain Stem Control of Motor Function
	Discuss the functions of motor areas	
	Enlist the functions of brain stem	
	Name the descending motor tracts. Describe the functions of corticospinal tract.	
NS-P-013	Give Functional organization of spinal cord.	Spinal Cord Motor Functions and Reflexes
	Define reflex action and identify the components of a reflex arc.	

	Define, classify and enlist components of stretch reflex with special reference to jaw reflex).	
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NS-P-014	Define and give types of cerebrovascular accident along with their salient features.	Effect of Lesions in the Motor Cortex or in the Corticospinal Pathway
NS-P-015	Enlist the components of limbic system and its general functions.	The Limbic System and the Hypothalamus
	Enlist functions of different portions hypothalamus.	
	Explain the physiological basis and features of Alzheimer 's disease	
NS-P-016	Define memory.	Memory
	Classify memory on the basis of duration and information stored.	
NS-P-017	Define retrograde and anterograde amnesia	The Autonomic Nervous System and the Adrenal Medulla
	Explain the effects of sympathetic and parasympathetic on various organs/ system of body	
	Enlist types of autonomic receptors present in heart, blood vessels, smooth muscles, GIT, & EYE.	
	Give features of Alarm or stress response	
NS-P-018	Enlist the functions of CSF	Cerebral circulation
NS-P-019	Give functional divisions of cerebellum along with their functions.	Cerebellum and Basal Ganglia Contributions to Overall Motor Control
	Enlist cerebellar nuclei	
	Enlist features of cerebellar dysfunction	
NS-P-020	Enlist components of basal ganglia in relation to other structures of the brain	Contributions to Overall Motor Control

	Discuss functions of basal ganglia	
	Discuss pathophysiology and features of Parkinson's disease.	
NS-P-021	Enlist the primary taste sensations.	The Chemical Senses– Taste and Smell
	Trace the taste pathway	
	Enlist the primary sensations of smell	
	Describe the physiological anatomy and location of olfactory membrane and olfactory receptors	
BIOCHEMISTRY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
NS-B-001	Elaborate the structure of mannitol & give its clinical uses.	Osmotic diuretic
NS-B-002	Discuss neuropathies associated with deficiency/ toxicity of B1, B6 & B12.	Neuropathies
NS-B-003	Explain the biosynthesis, mechanism of action, and physiological role of acetylcholine, and discuss the clinical consequences of its deficiency	Neurotransmitters
	Outline the reactions involved in biosynthesis of catecholamines.	
	Elaborate the mechanism of action of catecholamines.	
NS-B-004	Briefly describe the cause, clinical features & management of Phenylketonuria.	Inherited disorders of amino acid metabolism
	Outline the metabolism of branched chain amino acids (BCAA).	
	Briefly describe the cause, clinical features & management of maple syrup urine disease (MSUD).	

NS-B-005	Briefly describe the consequences of protein misfolding (Alzheimer's disease and prion diseases).	Protein misfolding
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PHARMACOLOGY & THERAPEUTICS

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
NS-Ph-001	Describe the synthesis, storage, release and degradation of acetylcholine and norepinephrine of the ANS	Introduction to ANS
	Classify types of autonomic receptor (adrenergic and cholinergic) along with their location, actions and post receptor mechanism	
NS-Ph-002	Classify and name the prototype drugs acting on the autonomic nervous system according to their site and mechanism of action.	Classification

GENERAL PATHOLOGY & MICROBIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
NS-Pa-001	Define meningitis.	Infections of CNS
	Identify different types of meningitis according to etiology.	
	Differentiate between the CSF findings of different types of meningitis	
	Define encephalitis. Describe its etiology and pathogenesis	
	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Streptococcus pneumoniae	
	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Treponema pallidum	

Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of herpes simplex virus	
Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of varicella zoster virus	

	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Clostridium tetani and Clostridium botulinum	
	Describe the epidemiology, transmission, virulence factors, pathogenesis, laboratory diagnosis, and prevention of Spirochetes	
NS-Pa-002	Define concussion and contusion. Enlist their clinical features	Trauma to CNS
NS-Pa-003	Enumerate various demyelinating diseases of CNS Enlist clinical features and diagnosis of Multiple Sclerosis & Guillain-Barre syndrome	Demyelinating diseases of CNS

PRACTICALS / LAB WORK

NEUROANATOMY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
NS-A-036	Demonstrate gross neuroanatomical knowledge of the brain and brainstem with particular focus on the cranial nerves, including identification of their origin, course, nuclei, associated foramina, functional components, and clinical correlations using anatomical models and dissected cadaveric specimens	Nervous system

PHYSIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
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NS-P-022	Examination of trigeminal nerve.	CN V
NS-P-023	Examination of facial nerve.	CN VII
NS-P-024	Examination of 9 th , 10 th , 11 th & 12 th nerve.	CN IX, X, XI, XII
NS-P-025	Demonstrate Plantar reflex.	Motor System
NS-P-026	Demonstrate deep tendon reflex.	

THEORY		
ORAL BIOLOGY & TOOTH MORPHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-OB-001	Define the alveolo-cemental complex (periodontium) and explain its role in dental support.	Periodontium Overview
ALC-OB-002	Identify its components (cementum, PDL, alveolar bone, gingiva) and their diagrammatic arrangement around the tooth.	Components of Periodontium
ALC-OB-003	Define cementum and explain its biochemical properties Classify, explain and differentiate between different types of cementum and its properties	Cementum
ALC-OB-004	Describe the process of cementogenesis Explain molecular factors associated with cementogenesis	Cementogenesis
ALC-OB-005	Classify and explain the structure of different types of cementum and their properties.	Types of Cementum
ALC-OB-006	Explain age-related changes of cementum.	Age-related changes of cementum
ALC-OB-007	Describe cemento-enamel junction (CEJ) and attachment of cementum onto dentin	CEJ

ALC-OB-008	Differentiate between the structure of cellular and acellular cementum.	Cellular vs Acellular Cementum
ALC-OB-009	Describe the structure and functions of alveolar bone.	Alveolar Bone Structure and Function
ALC-OB-010	Elaborate its changes with age and its clinical considerations.	
ALC-OB-011	Outline the chronological stages of healing in an Extraction Socket, from the formation of the blood clot to the final replacement by lamellar bone.	Bone Repair and Remodeling in the Extraction Socket
ALC-OB-012	Discuss the development of Periodontal Ligament (PDL)	Development of PDL

ALC-OB-013	Enlist the structure and function of the periodontal ligament.	PDL Structure & Function
ALC-OB-014	Describe the cellular component of PDL	PDL cellular component
ALC-OB-015	Describe the principal fiber bundles of PDL.	PDL Fiber Bundles
ALC-OB-016	Describe the adaptation of the periodontal ligament to the functional demands.	Functional Adaptation of Periodontal Ligament
ALC-OB-017	Describe the blood supply and nerve supply of PDL	Blood and Nerve Supply of PDL
ALC-OB-018	Describe the mechanisms of PDL cell recruitment during tissue turnover and repair.	PDL remodeling and regeneration.
ALC-OB-019	Describe the histological aspects of gingiva.	Gingival Histology

ALC-OB-020	Enumerate gingival fibers & their functions.	Gingival Fibers
ALC-OB-021	Tabulate blood and nerve supply of gingiva.	Gingival Blood and Nerve Supply
ALC-OB-022	Describe the structural and functional characteristics of different areas of Gingival epithelium	Gingival Epithelium
ALC-OB-023	Describe gingival sulcus and explain the development and structure of dentogingival junction (DEJ)	Dentogingival Junction
ALC-OB-024	Explain the histological mechanisms of repair at the DEJ	Healing and Regeneration of the DEJ
ALC-OB-025	Explain the structure of mucogingival junction.	Mucogingival junction.
ALC-OB-026	Describe eruption and phases of tooth movement.	Tooth Eruption Phases Pre-eruptive Tooth Movement
	Elaborate pre-eruptive tooth movement.	

ALC-OB-027	Discuss the mechanism and factors responsible for eruptive tooth movement.	Eruptive Tooth Movement Mechanisms
ALC-OB-028	Describe the types of movement a tooth makes post- eruption to maintain its functional position in the jaw in terms of mechanism and significance.	Post-eruptive Tooth Movements
ALC-OB-029	Discuss histology and causes of tooth shedding.	Tooth Shedding

PATHOLOGY & MIRCObIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-Pa-001	Define acute inflammation and its pathological basis relevant to dental conditions.	Acute Inflammation in Dental Conditions

ALC-Pa-002	Enlist stimuli for acute inflammation, including microbes, trauma, and chemical irritants relevant to oral infections.	Stimuli of Acute Inflammation in Oral Health
ALC-Pa-003	Classify chemical mediators of acute inflammation and their role in dental diseases such as dental abscess formation.	Chemical Mediators of Acute Inflammation in Dentistry
ALC-Pa-004	Explain vascular and cellular events in acute inflammation and its relation to dental conditions like pulpitis and periodontitis.	Vascular and Cellular Events in Acute Inflammation
ALC-Pa-005	Describe systemic effects of acute inflammation, such as fever and leukocytosis, and their impact on dental treatment.	Systemic Effects of Acute Inflammation
ALC-Pa-006	Identify and explain the role of microbes causing acute inflammation in dental infections, such as Streptococcus mutans and Porphyromonas gingivalis.	Microbes Causing Dental Infections
ALC-Pa-007	Analyze morphological patterns of acute inflammation, such as purulent or fibrinous types, in oral diseases.	Morphological Patterns of Acute Inflammation in Oral Diseases

ALC-Pa-008	Define chronic inflammation and its significance in persistent oral and systemic conditions.	Chronic Inflammation and Its Oral/Systemic Significance
ALC-Pa-009	Identify chronic inflammatory cells, such as macrophages and lymphocytes, and mediators like TNF-a and IL-1.	Chronic Inflammatory Cells and Mediators
ALC-Pa-010	Discuss Porphyromonas and Fusobacterium with its pathogenesis.	Pathogenesis of Porphyromonas and Fusobacterium

PERIODONTOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-Pe-001	Define key terminologies related to periodontal diseases: Gingivitis, periodontitis, periodontal pockets, clinical attachment level and periodontal bone loss	Periodontal Disease Terminology
ALC-Pe-002	Define & Classify Periodontal Diseases	Periodontal Disease
ALC-Pe-003	Identify the microbial composition of healthy gingival and periodontal tissues.	Healthy Microbial Composition and Periodontal Homeostasis
ALC-Pe-004	Enlist key red complex bacterial species involved in periodontal disease (e.g., Porphyromonas gingivalis, Tannerella forsythia, Treponema denticola).	Pathogenic Bacterial Species in Periodontal Disease
ALC-Pe-005	What is Plaque biofilm and how is it formed and what is its role in periodontal diseases.	Plaque Biofilm Formation and Role in Disease
ALC-Pe-006	Describe dental plaque biofilm as the major factor contributing to development of periodontal disease, and its relationship with host, genetic and local predisposing factors in exacerbating periodontal conditions.	
ALC-Pe-007	Explain the adherent nature of dental plaque and why it is not easily visualized. Describe the importance of plaque disclosure and justify the need for mechanical plaque removal by both the patient and oral health professionals.	Plaque Visualization, Disclosure, and

		Mechanical Removal
ALC-Pe-008	Explain the role of dental calculus in periodontal disease. Differentiate between supragingival and subgingival calculus, Describe the formation, mineralization, and microbial composition of calculus, and explain how calculus acts as a plaque-retentive surface contributing to periodontal disease progression.	Dental Calculus Formation, Composition, and Role in Disease

ALC-Pe-009	Enlist other predisposing factors (other than calculus) that predispose to plaque formation and consequent periodontal disease like gingivitis.	Other Predisposing Factors for Plaque Formation
ALC-Pe-010	Describe the etiology and pathogenesis of scurvy with emphasis on the biochemical role of Vitamin C in collagen synthesis and its clinical implications on periodontal tissue integrity	Scurvy and Vitamin C Role in Periodontal Health
ALC-Pe-011	Enlist methods of plaque removal techniques	Plaque removal techniques

DENTAL RADIOLOGY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-DR-001	Define the role of radiology in diagnosing and assessing periodontal diseases. Explain radiological features of healthy periodontium.	Role of Radiology in Periodontal Disease
ALC-DR-002	Interpret key radiographic signs of periodontal disease, including crestal bone loss, widening of the periodontal ligament space, and calculus deposits.	Interpretation of Radiographic Signs in Periodontal Disease

COMMUNITY & PREVENTIVE DENTISTRY

CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-CD-001	Define and explain the key periodontal indices used in epidemiological studies (Gingival Index, Plaque Index, OHI-S, CPI, CPITN).	Periodontal Indices
ALC-CD-002	Differentiate between various periodontal conditions based on pathophysiology and clinical signs.	Periodontal Conditions

ALC-CD-003	Describe the stages and progression of gingivitis and periodontitis.	Disease Progression
ALC-CD-004	Explain the principles and methodology for measuring gingivitis and periodontitis; interpret findings using standard indices.	Measurement Methods in Periodontal Health

ALC-CD-005	Perform and interpret the Community Periodontal Index of Treatment Needs (CPITN) to assess periodontal status and identify treatment needs.	CPITN and Treatment Needs Assessment
ALC-CD-006	Conduct dietary history for caries risk assessment and demonstrate use of indices (Gingival Index, Plaque Index, CPI, CAL) in oral health surveys.	Oral Health Assessment and Risk Evaluation

PRACTICALS / LAB WORK		
PATHOLOGY & MICROBIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-Pa-011	Identify histological slides of acute, chronic & granulomatous inflammation.	Histological Identification
PERIDONTOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-Pe-011	Demonstrate plaque removal techniques including proper brushing and flossing.	Brushing and Flossing Techniques
DENTAL RADIOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-DR-003	Identify normal periodontal structures on radiographs (OPG and periapical).	Normal Periodontal Structures on Radiographs
ALC-DR-004	Observe alveolar bone and assess bone levels.	Alveolar Bone Observation and Level Assessment
ALC-DR-005	Identify the periodontal ligament (PDL) space on radiographs.	Periodontal Ligament Space Identification

ALC-DR-006	Identify the lamina dura on radiographs.	Lamina Dura Identification
ALC-DR-007	Recognize the cementoenamel junction (CEJ) on radiographs.	Cemento-enamel Junction Recognition
ALC-DR-008	Differentiate between cortical and cancellous bone on radiographs.	Cortical vs. Cancellous Bone Differentiation

ORAL BIOLOGY & TOOTH MORPHOLOGY		
CODE	SPECIFIC LEARNING OUTCOMES	TOPIC
ALC-OB-030	Draw and label the differentiation of cementoblasts from ectomesenchymal cells & the fragmentation of Hertwig's epithelial root sheath.	Cementoblast
ALC-OB-031	Draw and label the types of cemento-enamel junction	CEJ
ALC-OB-032	Draw and label cellular cementum.	Cellular Cementum
ALC-OB-033	Draw and label the alveolar and bundle bone	Alveolar & Bundle Bone
ALC-OB-034	Draw and label the periodontal ligament in a cross-section between teeth	PDL cross-section
ALC-OB-035	Draw and label the arrangement of principal fiber group within the periodontium.	Principal fibers group of PDL
ALC-OB-036	Draw and label the gingival group of fibers (gingival ligament).	Gingival group of fibers
ALC-OB-037	Draw and label different anatomical zones of gingiva; mucocutaneous junction, mucogingival junction, & dentogingival junction.	Gingiva & its Junctions

