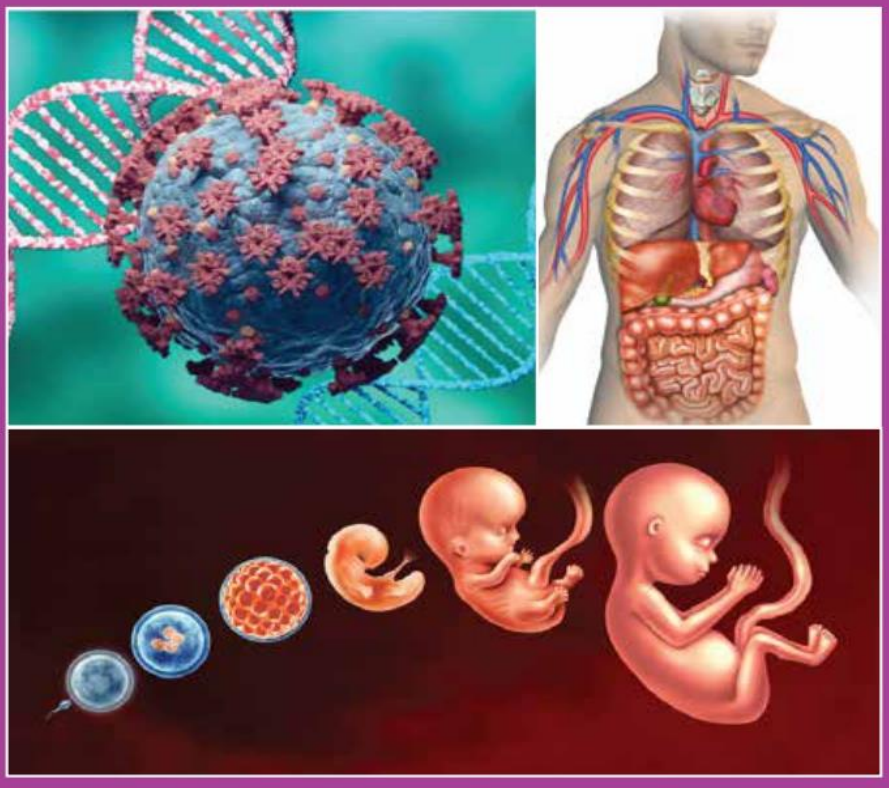
STUDY GUIDE

Block - I

Foundation - I & Haematopietic & Lymphoid Module

1st Year MBBS



Department of Medical Education
Aziz Fatimah Medical & Dental College
Faisalabad

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Al-Fatmah Medical & Dental College

1. List of Abbreviations

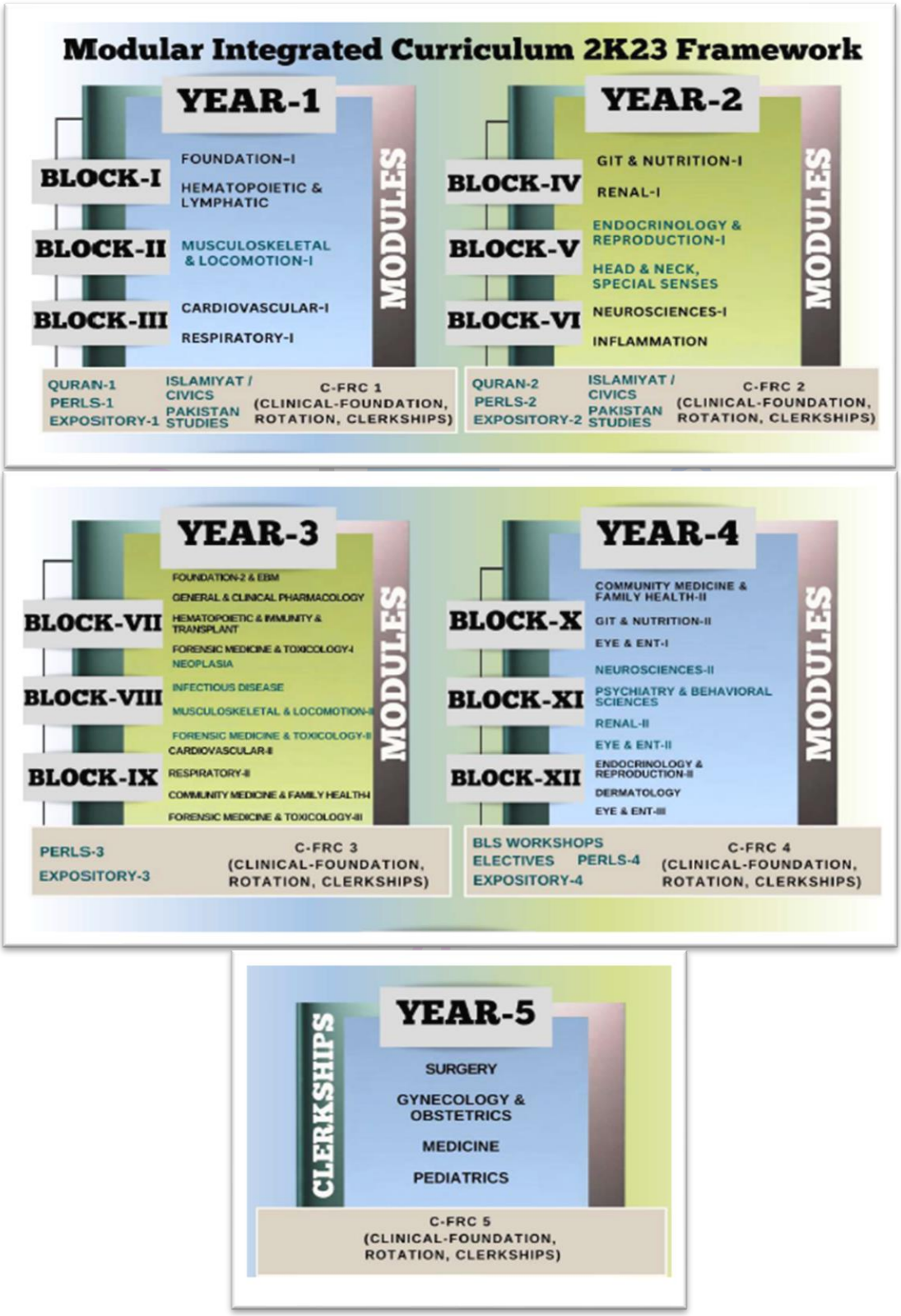
Abbreviations	Subjects
A	Anatomy
ABCDE	Airway, Breathing, Circulation, Disability, Exposure
ABG	Arterial Blood Gas
ACS	Acute Coronary Syndromes
Ag	Aging
AKI	Acute Kidney Injury
ALT	Alanine Transaminase
AMI	Acute Myocardial Infarction
AMP	Adenosine Monophosphate
ANA	Antinuclear Antibody
ANCA	Antineutrophil Cytoplasmic Antibodies
ANS	Autonomic Nervous System
AO	Association of Osteosynthesis
APTT	Activated Partial Thromboplastin Clotting Time
ARDS	Acute Respiratory Distress Syndrome
ARVC	Arrhythmogenic Right Ventricular Cardiomyopathy
ASD	Atrial Septal Defect
AST	Aspartate Aminotransferase
ATLS	Advanced Trauma Life Support
Au	Autopsy
AUC	Area Under The Curve
AV	Atrioventricular
B	Biochemistry
BhS	Behavioral Sciences
BHU	Basic Health Unit
BSL	Biological Safety Level
C	Civics
C-FRC	Clinical-Foundation Rotation Clerkship
C. burnetii	*Coxiella burnetii*
C. neoformans	Cryptococcus neoformans
C. pneumoniae	*Chlamydia pneumoniae*
C. psittaci	*Chlamydia psittaci*

C. trachomatis	*Chlamydia trachomatis*
CA	Cancer
CABG	Coronary Artery Bypass Grafting
CAD	Coronary Artery Disease
CBC	Complete Blood Count
CCR5	Cysteine-Cysteine Chemokine Receptor 5
CD31	Cluster of Differentiation 31
CD34	Cluster of Differentiation 34
CD4	Clusters of Differentiation 4
CF	Cystic Fibrosis
CK	Creatine Kinase
CK	Creatine Kinase
CLED	Cystine Lactose Electrolyte Deficient
CLL	Chronic Lymphocytic Leukemia
CM	Community Medicine
CML	Chronic Myelogenous Leukemia
CMV	Cytomegalovirus
CNS	Central Nervous System
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CODIS	Combined Dna Index System
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Corona Virus Disease 2019
COX	Cyclooxygenase
CPR	Cardio Pulmonary Resuscitation
CR	Clinical Rotation
CRP	C- Reactive Protein
CSF	Cerebrospinal Fluid
CT	Computed Tomography
CT	Computerized Tomography
CV	Cardiovascular
CVA	Cerebral Vascular Accident
CVDs	Cardiovascular Diseases
CVS	Cardiovascular System
D. medinensis	Dracunculus Medinensis
DALY	Disability-Adjusted Life Year

DCIS	Ductal Carcinoma *in situ*
DCM	Dilated Cardiomyopathy
DCMLS	Dorsal Column Medial Lemniscus System
DLC	Differential Leukocyte Count
DMARDs	Disease-modifying antirheumatic drugs
DNA	Deoxy Ribonucleic Acid
DOTS	Directly Observed Treatment Short-course
DTP	Diphtheria, Tetanus, Pertussis
DVI	Disaster Victim Identification
DVT	Deep Vein Thrombosis
E. coli	*Escherichia coli*
ECF	Extra Cellular Fluid
ECG	Electrocardiography
ECG	Electocardiogram
ECP	Emergency contraceptive pills
ED50	Median Effective Dose
EEG	Electroencephalogram
EIA	Enzyme Immunoassay
ELISA	Enzyme Linked Immunosorbent Assay
EnR	Endocrinology & Reproduction
ENT	Ear Nose Throat
EPI	Expanded Programme on Immunization
ER	Emergency Room
F	Foundation
FAST	Focused Assessment with Sonography in Trauma
FEV1	Forced Expiratory Volume 1
FM	Family Medicine
For	Forensics Medicine
FPIA	Fluorescent Polarization Immunoassay
FS	Forensic Serology
FSc	Forensic Science
FVC	Forced Vital Capacity
GCS	Glasgow Coma Scale
GFR	Glomerular Filtration Rate
GIT	Gastrointestinal tract
GL-MS	Gas Liquid Mass Spectrometry

GLC	Gas Liquid Chromatography
GLP	Good Laboratory Practice
GMP	Guanosine Monophosphate
GO	Gynecology and Obstetrics
GP	General Practitioner
GPE	General Physical Examination
GTO	Golgi Tendon Organ
Gynae & Obs	Gynecology and Obstetrics
H & E	Hematoxylin and Eosin
H. influenzae	*Haemophilus influenzae*
H. pylori	*Helicobacter pylori*
HAI	Healthcare Associated Infections
HbC	Hemoglobin C
HbS	Sickle Hemoglobin
HbSC	Hemoglobin Sickle C Disease
HCL	Hydrochloric Acid
HCM	Hypertrophic Cardiomyopathy
HHV	Human Herpesvirus
HIT	Hematopoietic, Immunity and Transplant
HIV	Human Immunodeficiency Virus
HL	Hematopoietic & Lymphatic
HLA	Human Leukocyte Antigen
HMP	Hexose Monophosphate
HNSS	Head & Neck and Special Senses
HPLC	High Pressure Liquid Chromatography
ICF	Intra Cellular Fluid
ID	Infectious Diseases
IE	Infective Endocarditis
IL	Interleukin
ILD	Interstitial Lung Disease
IN	Inflammation
INR	International Normalized Ratio
INSTIs	Integrase Strand Transfer Inhibitors
IPV	Inactivated Poliovirus Vaccine
IUD	Intrauterine Device
IUGR	Intra Uterine Growth Restriction

2. Curriculum 2k23 Framework



3. Introduction to Study Guide

The study guide serves several crucial purposes:

1. **Communicating information on the organization and management of the module:**

   This aids students in identifying the appropriate point of contact in case they encounter any difficulties during the semester.

2. **Defining the objectives expected to be achieved by the end of the module:**

   It outlines clear learning goals, ensuring that students understand what is expected of them academically.

3. **Identifying the learning strategies employed to achieve module objectives:**

   These strategies may encompass various methods such as lectures, small group sessions, clinical skills practice, demonstrations, tutorials, and case-based learning.

4. **Providing a list of learning resources:**

   Students are offered a comprehensive list of resources, including books, computer-assisted learning programs, web links, and journals. These resources empower students to maximize their learning potential.

5. **Highlighting information on the contribution of continuous assessment and semester examinations:**

   This section emphasizes the significance of ongoing assessments and final exams in determining a student's overall performance in the module.

6. **Including information on assessment methods:**

   Details about the various assessment methods employed to evaluate students' progress in achieving the objectives are outlined.

7. **Focusing on examination policies, rules, and regulations:**

This section clarifies the policies and regulations governing examinations, ensuring that students are well-informed about the rules they must adhere to during their assessments.

By providing students with this comprehensive guide, educational institutions aim to enhance their learning experience, facilitate effective academic management, and foster compliance with academic standards and regulations.

4. Implementation Team for 1st Professional MBBS

Academic Year In charge	**Prof. Dr Quddus ur Rehman**		
Head of Medical Education	**Dr. Ayesha Sadiq**		
Block Coordinator	**Block I** Prof. Dr. Shakeel Ahmad	**Block 2** Prof. Dr. Quddus ur Rehman	**Block 3** Prof. Dr. Qamar Mehboob
Module In-charges	**Same**		
Subject leads	Anatomy Biochemistry Physiology Community medicine Pathology Pharmacology Medicine Surgery BS PERL's CFRC	Anatomy Biochemistry Physiology Community medicine Pathology Pharmacology Medicine Surgery Orthopedics Radiology BS PERL's CFRC	Anatomy Biochemistry Physiology Community medicine Pathology Pharmacology Cardiology Pulmonology Radiology Surgery BS PERL's CFRC
Assessment coordinator	**Dr. Ayesha Sadiq**		
Timetable coordinator	**Miss Huma Afzal**		
Principal AFMDC	**Prof. Dr. Ghulam Abbas Sheikh**		

FOUNDATION-1 MODULE

5. Introduction of Foundation-I Module

Welcome to the Foundations module, where we embark on a journey deep into the intricacies of life processes within the human body. At its core, our exploration begins with the remarkable cell, the fundamental unit of life. Understanding its structure lays the groundwork for comprehending how cells communicate and transport essential substances, maintaining a delicate balance within the body known as homeostasis. This balance extends to the chemical reactions that drive cellular processes, ensuring optimal function and health.

As we delve further, we uncover the vital role of blood in maintaining homeostasis, acting as a conduit for nutrients, oxygen, and immune defense. This intricate network of circulation is intimately linked with the autonomic nervous system, which regulates involuntary processes such as heart rate and digestion, seamlessly integrating with the body's movement.

Indeed, movement is a symphony orchestrated by muscles, each contraction and relaxation finely tuned to enable mobility and support bodily functions. These muscles, governed by the autonomic nervous system, adapt and grow throughout life, reflecting the ongoing process of growth and development.

From the earliest stages of embryogenesis to the complexities of adulthood, the human body undergoes a remarkable journey marked by growth and change. Genetics, nutrition, and environmental factors intricately influence this journey, shaping the individual from infancy to old age.

In conclusion, our exploration of these interconnected themes provides a holistic understanding of human biology, underscoring the intricate web of relationships that govern life processes. By mastering these foundational concepts, we not only gain insight into the mechanisms of health and disease but also cultivate the skills necessary for clinical practice. Welcome to the beginning of your journey in the noble pursuit of healing and improving the lives of others.

5.1. Module Rationale

Tomorrow's doctor is required to acquire competencies, which could align his knowledge base and skill set for his professional practices. The foundation of knowledge needs to commence from 'The Cell'. The cell is a structural and functional unit of life and has a role in normal homeostasis ensuring appropriate cellular functions. Hence, this module has been designed to introduce a blend of molecular, genetic, anatomical, physiological, and psychosocial information essential for developing a perspective on the function of the human body in health and disease. Besides, an initial orientation to pharmacology and pathology subject has been provided so that students are able to use this information in the coming modules.

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5.2. Module Outcomes

1. Describe the microscopic features of nerve cells, muscle cells, general features of epithelia of the body.
2. Appraise the functional characteristics of various components of cell membrane and organelles of cell.
3. Differentiate between the dynamics of various transport mechanisms along the cell membrane.
4. Compare the functional differences between RBCs, WBCs and blood groups.
5. Explain the significance of homeostatic mechanisms in keeping body's internal environment nearly constant.
6. Appraise the formation and functions of autonomic nervous system.
7. Correlate the structural design of each organ to its function.
8. Acquire information about the different fascial planes in the different regions of the body & their surgical importance.
9. Use descriptive anatomical terms of position to describe the different body structures in relation to each other.
10. Describe the movements of body using proper anatomical terms of movement.
11. Describe and demonstrate the various bony landmarks.
12. Describe the types of joints and correlate them to the mechanisms of movement.
13. Classify the bone, joints and muscles based on the structure, function, and phylogenetic origin.
14. Describe the structures associated with muscles and explain their functional correlations.
15. Classify and describe the cardiovascular system and correlate it functionally.
16. Amplify the anatomical basis for radiological, cross-sectional, and surface anatomy.
17. Correlate clinicopathologically the apoptosis in health & diseases.

5.3. Learning Objectives

5.3.1. Knowledge

➢ **Anatomy**

Topic	Sub Topic	Learning objectives
Gross Anatomy	Introduction to General Anatomy	• Briefly describe the applied branches of anatomy • Describe the "Anatomical Position" Describe the anatomical planes of body. • Describe the terms of relationship, commonly used in Anatomy. Describe the anatomical terms used specifically for Limbs. Describe the terms related to movements
	Bones (Osteology)	• Describe, identify, and exemplify the general morphological features of bones. • Describe the developmental classification of bones. • Describe the regional classification of bones. • Describe the morphological classification of bones. • Describe and exemplify Sesamoid, Pneumatic, Wormian and Heterotopic bones. • Describe the general features of adult typical long bone. • Describe the types of epiphyses • Discuss the general concept of ossification (primary and secondary centers and rule of ossification) • Describe the relationship of growing end of bones with the direction of nutrient foramen • Describe the blood supply of various types of bones • Describe the salient features of common types of fractures and basic concept of healing of fracture.
	Cartilage (Chondrology)	• Describe the general features of cartilage and its importance in gross anatomy. • Describe the subtypes and gross features of Hyaline Cartilage • Differentiate the three types of cartilages
		• Describe and exemplify the structural classification of Joints (synovial,

	Joints (Arthrology)	cartilaginous & fibrous) along with their sub-classification. • Describe the components and characteristic features of a Synovial Joints. Describe the blood supply, innervation of Synovial Joints, cartilaginous joints, and fibrous joints. • List the factors stabilizing a synovial joint. • Define common joint injuries and diseases
	Integumentary System	• Describe the structure and function of Skin on the basis of its two layers; Epidermis and Dermis • Describe the structure of Hair as an appendage of skin. • Describe the structure of Nail as an appendage of skin. • Describe the structure of Sweat and Sebaceous Glands • Describe the structure and function of Superficial Fascia • Describe the structure, function, and modifications of Deep Fascia • Describe important clinical correlates of skin (skin infections, sebaceous cyst, skin burns and skin grafting)
	Muscle Tissue (Myology)	• Classify and describe muscle tissue based on Structure, Function and Development. • Describe Somatic and Visceral muscles. • Describe and differentiate the Red and White variety of Skeletal muscles. • Classify and describe the skeletal muscles based on architecture. • Classify skeletal muscle based on action. • Describe the parts of a skeletal muscle. • Describe and differentiate the basic organization of innervation to skeletal, smooth, and cardiac muscle. • Describe the structure of Synovial Bursae • Comprehend the meaning of Hypertrophy, Hemiplegia, quadriplegia, paraplegia, hemiparesis
	Vascular System (Angiology)	• Classify the types of blood circulation. • Classify and exemplify various types of blood vessels.

		• Describe and exemplify various types of anastomoses. • Explain the importance of End Arteries • Describe the general organization of Lymphatic Circulation • Define the terms: Lymphoid Tissue, Tissue Fluid, Lymphatic Capillaries, Lymph and Lymphatic Vessels • Define the terms; Lymphangitis, Lymphadenitis
	Nervous Tissue (Neurology)	• Define neuron. • Describe the anatomical structure of a neuron. • Classify neurons based on morphology with examples. • Classify neurons based on function. • Describe the components of the central nervous system. • Describe the components of the peripheral nervous system. • Name the supporting cells (neuroglia) of the central nervous system. • Describe the structure and functions of the neuroglia of the central nervous system. • Enumerate the supporting cells (neuroglia) of the peripheral nervous system. • Describe the structure and functions of the neuroglia of the peripheral nervous system. • Enlist the cranial nerves I to XII • Describe the types of nerve fibers carried by and distribution of the cranial nerves. • Describe the formation, types of modalities carried by, and distribution of the spinal nerves. • Define and explain Dermatome (s) • Define and explain Myotome (s) • Describe the formation of Plexuses. • Differentiate between Somatic and Visceral nervous system. • Define Receptors Describe the functions of receptors. • Classify sensory receptors based on modality (with location) • Define Effectors • Describe the functions of effectors.

		• Describe ANS (Autonomic Nervous System) and differentiate between sympathetic and parasympathetic nervous system
	Imaging in Anatomy	• Identify displacement of fracture segments of the bone Identify dislocation of joints
Embryology & Post-Natal Development	Cell division and Chromosomal Abnormalities	• Define Chromosome Theory of inheritance • Enlist different stages of Mitosis and Meiosis • Compare and contrast mitosis and Meiosis • Enlist the numerical chromosomal anomalies • Describe the anatomical basis for numerical chromosomal abnormalities • Describe the clinical presentation of numerical chromosomal abnormalities and justify them Embryologically • Describe the clinical presentation of structural chromosomal abnormalities and justify them Embryologically • Describe the embryological basis for mosaicism • Describe the embryological basis for teratoma • Describe Concept of Gene Mutation. Enlist common diagnostic techniques for identifying genetic abnormalities.
	Gametogenesis Spermatogenesis	• Describe the Process of spermatogenesis and spermiogenesis • Describe the embryological basis for Abnormal gametes
	Gametogenesis and Oogenesis	• Describe the Prenatal and postnatal maturation of oocyte
	Oogenesis	• Describe the significance of arrested development of oocyte
	Gametogenesis	• Compare and contrast oogenesis and spermatogenesis
	Female Reproductive Cycle	• Describe the hormonal control of female reproductive cycles • Enumerate and describe the steps of the ovarian cycle • Describe the process of ovulation • Describe the formation, function and fate of corpus luteum • Define Mittelschmerz pain • Define menstrual cycle • Describe the phases of menstrual cycle
	Transportation of	• Describe the transportation of Oocyte

	gametes	
	Fertilization	• Describe Capacitation and Acrosomal Reaction • Define fertilization • Describe the phases of fertilization • Draw and label a diagram illustrating the phases of fertilization • Enumerate and describe the results of fertilization
	Contraception	• Define contraception • Explain the mechanisms of following contraceptive techniques: o Barrier methods o Hormonal methods o Intrauterine device (IUD) o Emergency contraceptive pills o (ECPs) o Male and female sterilization
	Infertility & assisted Reproductive techniques	• Describe the anatomical and physiological basis of male and female infertility • Define assisted reproductive techniques • Describe the mechanisms of In vitro fertilization (IVF) and embryo transfer • Explain the correlation of multiple births with assisted reproductive techniques
	Cleavage, blastocyst formation	• Describe the process of cleavage of embryo and blastocyst formation • Describe the origin and uses of embryonic stem cells and the techniques of obtaining these cells from the embryo (reproductive cloning & therapeutic cloning) • Explain the embryological basis of spontaneous abortion • Compare and contrast the villi • Describe the process of Compaction • Describe the Formation of morula (division into inner and outer cell mass)
	Implantation Week 2 of Development	• Describe the Uterus at the time of implantation (decidua reaction) • Illustrate the concept of Implantation • Describe the Abnormal implantation/ extra uterine implantations • Define the Molar pregnancy. • Describe the formation of amniotic cavity, embryonic disc, and umbilical vesicle

		• Describe the formation of chorionic sac.
	Utero-placental circulation	• Describe the Establishment of utero-placental circulation
	Gastrulation	• Describe the Formation & fate of primitive streak • Draw a concept map highlighting the sequence of events responsible for transformation of bilaminar germ disc into trilaminar germ disc • Describe the embryology behind sacrococcygeal teratoma and justify its clinical picture
	Formation of notochord	• Describe the Invagination and movement of prenotochordal cells • Describe the Notochordal plate formation • Describe the Neuroenteric canal formation • Describe the fate of the notochord • Describe the Establishment of body axis • Draw and label the fate map establishment • Describe the Fate map establishment • Describe the molecular basis for notochord formation • Describe the role of notochord as an inducer • Describe the embryological basis for situs inversus Sirenomelia, holoprosencephaly • Describe the development of trophoblast and chorionic villi during 3rd week of development
	Derivatives of ectoderm	• Describe the Formation of neural tube from neural plate. • Justify embryologically the clinical picture seen in various neural tube defects • Describe the process of Migration of neural crest cells • Enlist the Derivatives of neural tube and describe the fate of each • Enlist the Derivatives of neural crest cells Enlist the ectodermal derivatives • Describe important Neural tube defects
	Mesodermal derivatives	• Describe the Differentiation of mesoderm into its constituting components • Describe the Somite formation and its fate • Describe the Estimation of age by somites • Describe the formation of intra-embryonic coelom

	Early development of CVS	• Describe the processes of vasculogenesis & angiogenesis • Explain the features of primordial cardiovascular system • Describe the anatomical justification for Capillary hemangiomas
	Folding of Embryo	• Describe the Cephalo-caudal folding • Describe the Lateral folding
	Germ layer derivatives	• Enlist the derivatives of germ layers • Enlist and Describe the Derivatives of intermediate and lateral plate mesoderm Enlist & Describe the Derivatives of endoderm • Enlist & describe the derivatives of ectoderm
	Folding of Embryo Embryonic period	• Enlist the characteristic features of the embryo during 2nd month. • Describe the criteria for estimating the developmental staging in human embryos • Explain the estimation of gestational & embryonic age
	Fetal period	• Explain the measurement and characteristics of fetus/Key events during Embryonic Period. • Describe the Overview of External appearance of fetus during fetal period. Enlist developmental horizons during fetal life event. • Describe Viability of fetuses and low birth weight babies • Explain the factors influencing fetal growth • Describe the clinical problems encountered by babies born with IUGR (Intra Uterine Growth Restriction)
	Fetal Status	• Tabulate the criteria for estimating fertilization age during the fetal period • Describe the procedures for assessing fetal status • Describe the clinical picture of IUGR & factors resulting in IUGR (Intra Uterine Growth Restriction) • Define Pre-eclampsia
		• List the fetal membranes • Describe the macroscopic & microscopic features of Decidua • Enlist the various parts of decidua Functionally correlate the parts of the decidua with its structure

	Placenta	• Describe the Changes in the trophoblast leading to the development of placenta • Describe the Structure (macroscopic & microscopic) of placenta • Enlist & correlate the Functions of placenta with its structure • Describe the Microscopic anatomy of Placental membrane • Describe the Placental circulation (fetal & maternal) • Embryologically justify the hemolytic disease of the neonate • Describe the functions of placenta
	Fetal membranes	• Describe the Formation & fate of Umbilical cord • Describe the Cord abnormalities Justify embryologically the clinical features observed in Absence of umbilical artery • Describe the formation and circulation of Amniotic fluid • Describe the Procedure of diagnostic amniocentesis • Explain the significance of amniotic fluid • Describe the factors responsible for Polyhydramnios and oligohydramnios. • Describe the consequences of oligohydramnios and polyhydramnios Define Amniotic Bands • Explain the formation and fate of umbilical vesicle (yolk sac) Define Physiological Umbilical Hernia
	Multiple pregnancies	• Describe the development of Dizygotic twins • Describe the development of Monozygotic twins • Describe the fetal membranes in twin pregnancy • Describe Fetus Papyraceous • Explain the zygosity of the twins • Describe the characteristics of various types of conjoined monozygotic twins
	Prenatal diagnosis and fetal therapy	• Define preterm Birth • Describe parturition & three stages of Labor. • Describe the Various methods of prenatal diagnosis • Describe the Fetal therapy

		• Describe Maternal serum Screening • Corelate levels of Alpha feto protein levels and fetal Anomalies • Describe stem cell transplantation and gene therapy
	Teratogenicity	• Define teratology and causes of birth defects • Define genomic imprinting • Define human disorders associated with genetic mutations • Describe birth defects caused by genetic factors: • numerical and structural anomalies • Define and enlist the teratogens • Describe the role of following in causing teratogenicity in humans: 1. Drugs 2. Environmental agents 3. Chemicals & heavy metals 4. Infectious agents 5. Radiation 6. Hormones 7. Maternal diseases • Describe the basis for male-mediated teratogens • Describe prevention of birth defects
Microscopic Anatomy (Histology & Pathology)	Introduction to microscopy & staining techniques	• Describe different types of microscopies • Describe Staining methods and their significance
	Cell membrane	• Describe the electron microscopic structure and fluid mosaic model of plasma membrane • Draw the fluid mosaic model of plasma membrane • Describe the structure of glycocalyx coat and lipid raft and correlate it with function • Describe different types of membrane proteins and their functions • Explain different modes of transport across the cell membrane
		• List the membranous and non-membranous cellular organelles • Describe the structure of the following cellular organelles and correlate with their function: Ribosomes

	Cell organelles	Endoplasmic reticulum (rough & smooth) Golgi apparatus Lysosomes Proteasomes Mitochondria Peroxisomes • Describe the structural components of cytoskeleton, and correlate them with their functions • Explain the histological basis of immotile cilia syndrome • Describe the histological features of cytoplasmic inclusions • Describe the structure of nuclear envelope and nuclear pores
	Cell nucleus	• Describe the structure of chromatin • Describe the structure of chromosome • Describe the structure of nucleolus • Describe the structure and types of DNA (Deoxy Ribonucleic Acid) and RNA(Ribonucleic Acid). • Describe the histological basis for apoptosis and necrosis • Describe structure of different types of cell junctions • Describe the cell cycle & cell division • Define important clinicopathological terms: Atresia, Hypertrophy, Atrophy, Hyperplasia, Metaplasia, Anaplasia, Neoplasia, Inflammation, Metastasis
		• Describe the histological structure and function of basement membrane (light and electron) • Draw and label a diagram illustrating the electron microscopic structure of basement membrane • Describe the basal surface modifications of epithelia • Describe the electron microscopic structure and functions of intercellular junctions (lateral surface modifications) and give their locations • Describe the Biochemical composition of the basolateral modifications

	Epithelium	• Describe the electron microscopic structure & functions of the following apical cell surface specializations: 1. Microvilli 2. Stereocilia 3. Cilia • Classify and exemplify the epithelia with their histological structure, locations and functions • Describe the structure of exocrine glands • Explain the mechanism of transport across the epithelia • Describe the classification of exocrine glands on the basis of: Shape of secretory portions and ducts Mode of secretion Type of secretion
	Connective tissue	• Describe the composition and list the constituents of connective tissue • Classify the connective tissue with examples • Describe the composition of ground substance of connective tissue • Describe the composition, distribution, and function of glycosaminoglycans in connective tissue • Describe connective tissue fibers, cells. Define Fibrosis • Describe the structure, distribution, and functions of the cells of macrophage-mononuclear phagocytic system • Describe the role of macrophages in innate immunity & formation of foreign body Giant cell • Describe the structure & functions of Mast cells. Role of Mast cells in immediate hypersensitivity reactions. • Describe structure of Plasma cells and their role in antibody formation. • Describe the types of adipose tissue (white & brown), their histogenesis, locations and function • Describe lipid storage and mobilization in and from adipocytes and compare the brown and white adipose tissue

➢ Physiology

Topic	Sub Topic	Learning objectives
Medical Physiology	Cell Biology	• Define Homeostasis • Explain control system of body by giving examples • Differentiate between Extracellular and Intracellular Fluids • Explain the positive and negative feedback mechanisms with examples • Explain the significance of feed forward/ adaptive control/delayed negative feedback mechanisms • Define normal body temperature, mechanism of heat production and heat loss. • Describe regulation of body temperature (role of hypothalamus). • Explain abnormalities of body temperature regulation. • Explain the structure of cell membrane • Enlist the types of cell membrane proteins • Enumerate the functions of membrane proteins • Define and enumerate the functions of cell Glycocalyx • Enlist membranous and non-membranous organelles • Enlist the self-replicative organelles • Differentiate between the functions of smooth and rough endoplasmic reticulum • Explain the functions of Golgi apparatus • Enlist the enzymes of lysosomes • Explain the functions of lysosomes • Enlist the enzymes of peroxisomes • Explain the functions of peroxisomes • Enumerate the components and functions of cytoskeleton • Define and enlist types of endocytosis • Explain the mechanism of pinocytosis • Classify different transport mechanisms • Compare the composition of Na(Sodium), K(Potassium) and Cl(Chloride) in extracellular and intracellular fluid • Define and enlist different types of diffusion

		• Explain the process of facilitated diffusion with the aid of diagram • Define and classify different types of active transport • Describe primary and secondary active transport with examples • Explain voltage and ligand gated channels with examples Name Na, K channel Blockers. • Discuss functions and significance of Na/K ATPase pump.
	Blood	• Enumerate the functions of blood • Explain the composition of blood • Enumerate the plasma proteins • Discuss functions of plasma proteins & describe the pathophysiology of edema
	Red Blood Cells	• Discuss the characteristics of red blood cells • Explain different types of Bone marrows • Enumerate the different sites of erythropoiesis at different ages • Explain the stages of erythropoiesis • Enumerate factors that regulate erythropoiesis • Discuss the site and role of erythropoietin in red blood cell production • Explain the significance of vitamin B12 and folic acid in maturation of red blood cell
	Hemoglobin	• Enumerate the types of normal hemoglobin in different ages of life • Explain the role of Iron in Hemoglobin formation. • Define blood indices, give their normal values & enumerate the conditions in which these values are disturbed (corelate with anemias) • Enlist the abnormal types of hemoglobin
		• Enumerate the types of white blood cells • Describe the characteristics and functions of Neutrophils • Explain the process of defense against invading agent by neutrophils • Define leukocytosis and leukemia • Explain the effects of leukemia on body • Define leukopenia • Explain the process of defense against invading agent by macrophages • Discuss different lines of defense during inflammation

	White Blood Cells	• Explain the functions of neutrophils and macrophages in spread of inflammation (walling off effect) • Define the Reticuloendothelial system • Enlist the different components of Reticuloendothelial system • Explain the characteristics and functions of basophils • Explain the characteristics and functions of eosinophils and enlist conditions in which these cells are raised
	Blood Types	• Enumerate different blood group types. • Explain the basis of ABO and Rh blood system • Explain the Landsteiner law

➢ Medical Biochemistry

Topic	Sub Topic	Learning objectives
Medical Biochemistry	Structure of cell	• Explain the concept of organization of cells to tissue, tissues to organ, and organs to system. • Differentiate between the eukaryotic and prokaryotic cells.
	Cell Membrane	• Describe the composition and structure of cell on biochemical basis and justify it as fluid mosaic model. • Describe the structure and function of cell membrane with particular reference to the role of (i) Lipids (ii) Carbohydrates (iii) Proteins • Explain why the cell membrane is called fluid mosaic model
	Signal transduction	• Discuss the various ways of cell-to-cell communication and to the environment. • Describe cell to cell communications. Cell signaling pathways (only G protein signaling i.e. Gs, Gi and Gq) • Describe cell to cell adhesion.
	Subcellular organelles	• Explain the biochemical markers and importance of subcellular organelles and their inherited disorders especially: a) I-cell disease b) Refsum disease

		c) Parkinsonism d) Progeria
	Chemistry of purine and pyrimidines	• Describe the chemistry of purines and pyrimidines and their linkage in nucleic acid synthesis and their metabolism
	DNA(Deoxy Ribonucleic Acid)	• Discuss the organization of DNA with special reference to Watson and crick model, composition structure, role of pairing. • Describe the structural forms of DNA
	RNA(Ribonucleic Acid)	• Discuss the structure of different types of RNAs with special reference to composition, linkage, functions hn RNA, micro RNA • Illustrate the structure and functions of various types of RNAs • Describe the functions of various small RNAs present in cell
	Nucleotides	• Explain the structure and nomenclature of nucleotides, biomedical importance of natural and synthetic analogues
	Chromosome	• Explain the higher organization of DNA. Difference between DNA, chromatid and chromosome
	Enzymes	• Describe enzymes with reference to: Active sites Specificity Catalytic efficiency Cofactor Coenzyme Holoenzyme Apo enzyme Prosthetic group Zymogens Location • Classify enzymes according to the reaction they catalyze and their nomenclature • Explain the mechanism of enzyme action from reactants to products (catalysis). • Discuss the effect of various factors on enzymatic activity: Substrate concentration Temperature PH Enzyme concentration • Explain the regulation of enzymatic activity (Michaelis Menten and Line weaver Burk's

		equation). Discuss inhibitors of enzymatic activity (with special reference to Km/V max) Competitive Non competitive Uncompetitive • Explain the application of enzyme in clinical diagnosis and therapeutic use
	Amino acids	• Classify amino acids based on polarity, nutritional importance and glucogenic/Ketogenic properties • Explain the structure, physical, chemical properties of amino acids and their biomedical importance
	Protein	• Classify proteins on the basis of functions, solubility and physicochemical properties and their biomedical importance. • Explain the structural levels of proteins Differentiate between alpha helix and beta pleated protein structures Identify bonding at different levels of proteins • Describe the role of chaperons in protein folding Interpret disorders related to protein misfolding on basis of given data Describe the biochemical basis of Alzheimer's disease/ prion disease
	Plasma proteins	• Classify and explain the bio-chemical role of each class of plasma proteins
	Immunoglobulins	• Explain the structure and biochemical role of immunoglobulins Describe the production, structure and functions of B cells, plasma cells, and antibodies (IgA, IgD, IgE, IgG, and IgM). Discuss the functions of the cytokines (Interleukins (ILs), Tumor Necrosis Factor (TNFs), IFs, Platelet derived growth factor (PDGF), and Platelet activating factor (PAF)). Interpret multiple myeloma on basis of given data

➢ Pathology

Topic	Sub Topic	Learning objectives
General Pathology	Cell Injury	• Discuss the significance of pathology. • Discuss the causes of cell injury. • Identify the types of cell injury. • Describe the mechanism of cell injury • Identify the types of cell death. • Define necrosis and apoptosis. • Describe different types of necrosis and mechanism of apoptosis. • Compare apoptosis with necrosis. • Define different types and mechanism of cellular adaptations (Hypertrophy, Atrophy, Hyperplasia and Metaplasia). • Define dysplasia and Neoplasia. • Discuss the mechanism and types of intracellular accumulations and pathological calcifications
	Introduction to Microorganisms	• Describe the structure of bacterial and virus. • Enlist medically important microbes causing infectious diseases. • Differentiate cell walls of gram positive and gram-Negative bacteria. • Compare the structure of bacterial cell and virus • Discuss the growth curve of bacteria and virus. • Enlist steps of viral replication • Enlist stages of infectious diseases. • Enlist stages of bacterial pathogenesis • Discuss the determinants of bacterial pathogenesis
	Sterilization & Disinfection	• Define sterilization and disinfection. • Describe the principles of sterilization and disinfection. • Describe clinical uses of common disinfectants and their mode of sterilization • Discuss physical and chemical agents of sterilization

➢ Pharmacology and Therapeutics

Topic	Sub Topic	Learning objectives
General Pharmacology	Pharmacokinetics	• Define Basic terms of General Pharmacology: drug, pro-drug, placebo, prototype drug, Orphan drug, Essential drugs, Pharmacology, First Pass effect, Volume of Distribution, Pharmacokinetics, Absorption, Distribution, Metabolism, Elimination Excretion, Biotransformation.
	Pharmacodynamics	• Define the following terms: • Pharmacodynamics, receptor, potency, efficacy, affinity agonist, partial agonist, inverse agonist, antagonist.
	Autonomic System	• Classify types of autonomic receptor (adrenergic and cholinergic) along with their location, actions and post receptor mechanism.

➢ Community Medicine & Public Health

Topic	Sub Topic	Learning objectives
Community medicine and public Health	Concept of health	• Describe the changing concepts and new philosophy of health • Explain responsibility for health
	Positive health Dimensions, health Determinants	• Explain dimensions and determinants of health and their role in achieving positive health • Discuss concept of health and wellbeing • Describe the Physical quality of Life Index & Human Development Index
	Health indicators	• Describe the importance of health indicators • Classify health indicators • Define Morbidity and Mortality • Describe Disability indicators • Compare indicators among countries
	Disease causation	• Conceptualize disease causation and natural history of disease • Explain Germ theory & multifactorial causation • Describe Epidemiological Triad Discuss Web of disease causation

		• Describe Gradient of infection
	Disease Prevention	• Describe principles of prevention and control on prevalent diseases • Explain difference between elimination and eradication • Describe disease surveillance, types and cycle • Explain Primary, secondary, & tertiary prevention • Describe five levels of interventions

➢ IMPACT (EPIDEMIOLOGY, SOCIOLOGY/SOCIETY, COMMUNITY MEDICINE & PUBLIC HEALTH)

Topic	Sub Topic	Learning objectives
Behavioral Sciences	Biological Basis of behavior	• Identify the Biological Basis of human behavior and discuss social behavior • Describe processes such as neurobiology of memory, emotions, sleep, learning, motivation, sex, arousal, reward and punishment
	Psychological Disorders	• Identify the burden of mental illness on the person, family and society • Describe Intellectual disability, Mental Disorders and Personality Disorders
	Psychology and Disease	• Identify the role of psychosocial factors in various illnesses • Describe psychosocial aspects of various system diseases such as CVS (Cardio vascular system), CNS(Central Nervous system), GIT(Gastro Intestinal Tract), Respiration, renal, endocrine and Cancer
	Behavioral factors and pharmacological treatment	• Identify the behavioral factors associated with pharmacological treatment of diseases • Discuss Health belief model, treatment compliance and its psychosocial factors, social factors in drugs prescription and drug resistance
	Palliative care	• Identify the rehabilitation work for patients on dialysis and any kind of physical disability • Discuss the care requirements in chronic debilitating conditions like Diabetes, Multi-

		infarcts Dementia, chronic renal disease, limb amputation
	Stress	• Identify the various physiological effects of stress Explain ANS response to stress, • Describe behavioural manifestations of stress Stress related multiple sclerosis and autoimmune diseases

➢ Aging

Topic	Sub Topic	Learning objectives
Process of Aging	Geriatrics Integrate with Biochemistry	• Discuss telomeres and telomerase and their clinical significance in aging.

5.3.2. Skills

➢ **Practical**

Topic	Sub Topic	Learning objectives
General Anatomy	Osteology Imaging and cross-sectional anatomy Arthrology	• Demonstrate the anatomical terms of position and movement, in particular on limbs. • Demonstrate various anatomical movements of body Identify various elevations and anatomical landmarks on bones. • Identify and interpret normal radiographs of various body regions • Identify and interpret joint dislocations and displaced fracture bone segments radiographically.
Histology	Staining techniques	• Describe different types of staining techniques and their significance with special emphasis on H&E staining
	Microscope	• Enlist important features of different parts of light microscope
	Cell shape	• Identify and draw and label different cell shapes under the microscope
	Epithelium	• Identify under light microscope and Draw & Label the following types of epithelia: Simple squamous Simple cuboidal Epithelium Simple columnar (ciliated & non-ciliated) Pseudostratified columnar (ciliated & non-ciliated) Stratified squamous (keratinized & non keratinized) Stratified cuboidal Stratified columnar Transitional • Identify under light microscope and Draw & Label serous & mucous secreting glands under light microscope
	Connective tissue	• Identify under light microscope and Draw & Label the various types of connective tissue
Embryology	Embryology	• Calculate fertilization age, gestational age, embryonic/fetal age and expected date of delivery. • On models, charts, aborted embryos and fetal specimens, identify the:

		➢ events of embryonic period, i.e., cleavage, morula and blastula formation, yolk sac, amniotic cavity, connecting stalk, • Placenta and its positional and implantational variations, umbilical cord and its contents. • Describe the USG(Ultrasonography) report for the: ➢ Fetal features, fetal age estimation, placental attachment with its variations and fetal membranes. multiple pregnancies • Gastrulation (notochord & primitive streak, three germ layers and their parts/derivatives), angiogenesis, neurulation, somites and embryonic age determination based on it, chorionic villi (primary, secondary & tertiary), developmental defects (sacrococcygeal teratoma, neural tube defects) fetal features during fetal period. Determine age of fetus based on these features.
Physiology	Consent	• Explain laboratory/clinical procedure to the subject. • Obtain verbal consent from subject before starting a procedure. • Reassure the subject after the procedure
	RBCs(Red Blood Cells)	• Determine Erythrocyte Sedimentation Rate and packed cell volume
	Blood Group	• Determination of blood group
	WBCs(White Blood Cells)	• Identify various types of WBCs in a prepared DLC (Differential Leukocyte Count)
Biochemistry	Lab hazards	• Demonstrate the step taken to prevent or rectify the Laboratory Hazards
	Cell	• Identify the structure of cells under microscope
	Cell organelles	• Identify the method of isolation of cell organelles
	Equipment	• Identify the different parts of equipment i.e., centrifuge, Micro lab, Electrophoresis, Hot Oven, Water Bath.

	Chromatography Solutions	• Detection of amino acids by paper chromatography • Prepare different types of solution Molar, Molal, Normal and %
Pathology	Cell Injury	• Identify the salient morphological features: Caseous necrosis (Gross & microscopic features), Coagulative necrosis (Gross), Fat necrosis(microscopic) • Identify the salient morphological features of Dystrophic calcification. • Identify the salient microscopic features of the following: Intestinal metaplasia, Squamous metaplasia, Hyperplasia • Identify the salient microscopic and gross features of Anthracosis.
Pharmacology	Sources of drugs	• Identify Sources of drugs through pictures: Animal, Plant, Microbiological, Minerals, Synthetic and genetically engineered sources. • **Plant sources:** Atropa Belladona, Pilocarpus Microphyllus, Papaver somniferum /Opium poppy, Erythroxylum coca, Cinchona bark, Digitalis Purpurae/ Fox glove plant, Rawulfia serpentine, Ephedra vulgaris, Curare, Catharanthus roseus, Podophyllum, Nux Vomica • **Animal sources:** Heparin (Pig/ Bovine), Insulin (Cow/Pig), Thyroxin (Sheep/Pig), Estrogen, Progesterone, Testosterone, Vitamin A, D (Cod liver), Vaccines • **Microbiological sources:** Penicillin's, Cephalosporins, Tetracyclines, Streptomycin, Streptokinase, Cyclosporine • **Mineral sources:** Iron, Magnesium, Zinc, Copper, Silver nitrate, Arsenic, Gold salts, Bismuth salts, Sulfur, iodine, Calcium salts • **Recombinant / Genetically engineered drugs:** Human insulin, Erythropoietin, Growth hormone, Alteplase • **Synthetic:** Sulfonamides, Anti-histamines, Benzodiazepines, Anti-epileptics

	Active Principles of drugs	• Identify and define the following Active Principles of drugs (alkaloids, glycosides, volatile oils, fixed oils) through pictures. • **Alkaloids:** Atropine, Caffeine, Morphine, Nicotine, Quinine, Reserpine, Codeine, Tubocurarine • **Glycosides:** Digoxin, Senna, Cascara • **Volatile oils:** Clove oil, Peppermint oils, Coriander oils, Dill oil, Ginger oil • **Fixed oils:** Coconut oil, Mustard oil, Olive oil, Castor oils, Cod liver oil
	Dosages	• Identify different dosage forms of drugs along with examples. Tablet, Capsule, Syrup, Suspension, Inhaler, Injection, Infusion, Ointment, Cream, Lotion, Lozenges, Suppository, Enema.
	Types of receptors	• Identify the types of transmembrane receptors (diagram) and give example.

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5.3.3. C-FRC for Foundation-1 Module

FOUNDATION MODULE		
Objectives	**Skill**	**Miller's Pyramid Level Reflected**
Demonstrate steps of hand washing	Hand washing	Shows
Demonstrate the procedure of taking thepulse	Radial Pulse	Shows
Record the Respiratory Rate of patient	Respiratory Rate measurement	Shows
Demonstrate the procedure of taking theBlood Pressure	Blood Pressure	Shows
Demonstrate the process of wearing thegloves	Donning and Doffing	Shows

HEMATOPOIETIC & LYMPHATIC MODULE

6. Introduction of Hematopoietic and Lymphoid Module

Welcome to the Hematopoietic and Lymphoid Module, a vital component of your medical education. In this module, we will explore the formation and function of blood cells, focusing on red blood cells (erythrocytes), platelets, and white blood cells (leukocytes). First, we will delve into erythrocytes, which transport oxygen throughout the body. Understanding their production and regulation is essential for comprehending oxygen delivery and anemia.

Next, we'll examine platelets, crucial for blood clotting and wound healing. We'll explore their role in preventing excessive bleeding and their involvement in thrombotic disorders.

Then, we'll explore leukocytes, the body's immune defenders. From granulocytes to lymphocytes, we'll study their development, functions, and their roles in infection control and immune surveillance.

Throughout, we'll highlight the interconnectedness between hematopoiesis and the lymphoid system. This includes understanding the structures and functions of lymphoid organs and their roles in generating immune responses.

By mastering these concepts, you'll gain a solid foundation for diagnosing and treating hematologic and immunologic disorders, preparing you for the challenges of clinical practice. Welcome to the intriguing world of hematopoiesis and lymphopoiesis

6.1. Module Rationale

"Blood is Life". Unlike any other organ, components of blood and immunity reflect/reveal disease processes in other organs as well. Therefore, studying blood is like opening a book to all aspects of medicine. Hence, this module has been designed to enable students to have a basic understanding about the normal structure, function and biochemistry of blood, immune and Lymphatic systems. Not only that, but students would also learn, when normal physiology and composition of blood and immune system is disturbed, what disorders result in our community. Emphasis has been given to incorporate deranged laboratory findings into the clinical problem solving.

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6.2. Module Outcomes

- Explain the function of all the organs / structures involved in this system and the mechanisms controlling them. (Spleen, lymph nodes, thymus, bone marrow, RBC's, WBCs and platelets
- Explain the etiology and pathogenesis of common blood & lymphatic diseases, particularly those of importance in Pakistan.
- Explain the rationale for the use of common therapeutic agents for the diseases related to
- Blood and immunity.
- Describe the role of immunity in the body
- Discuss the working & uses of laboratory instruments in diagnostic lab visit
- Relate red cell indices with health and disease
- Recognize ABO/RH blood grouping system
- Describe the role of Reticuloendothelial system in the body
- Describe the events of hemostasis
- Extrapolate the biochemical aspects of plasma proteins
- Discuss the pharmacological treatment of iron deficiency anemia
- Discuss Blood composition and function
- Discuss the role of liver in hemolytic anemia
- Practice history taking of a patient presented with blood disorders

6.3. Learning Objectives

6.3.1. Knowledge

➢ **Thorax**

Topic	Sub Topic	Learning objectives
Gross Anatomy	Hematopoietic & Lymphoid Tissue	• Identify and describe the components of the Hematopoietic & Lymphoid Tissue and their function • Describe the location, coverings, relations of Spleen • Describe the origin, course branches and distribution of Splenic artery • Describe the venous drainage of Spleen, Portal vein Formation, tributaries, and area of drainage. • Describe the location and relations of Thymus. Age related changes in Thymus
Embryology & Post-Natal Development	Developmental Anatomy of Spleen	• Describe the Intrauterine Development of spleen

➢ **Physiology**

Topic	Sub Topic	Learning objectives
Medical Physiology	Anemia	• Define classify and explain anemia on the basis of morphology and cause • Discuss the effects of anemia on the body
	Polycythemia	• Define polycythemia • Explain types of polycythemias • Discuss the effects of polycythemia on the body
	Hemostasis	• Define hemostasis • Describe the mechanisms by which hemostasis is secured

	Platelets	• Discuss the characteristics and functions of platelets • Explain the mechanism of formation of platelet plug
	Coagulation factors	• Enlist the clotting factors in blood • Explain the conversion of Prothrombin to Thrombin & formation of Fibrin Fibers • Explain the Intrinsic & extrinsic clotting pathway. • Name & explain the mechanism of anticoagulants used in laboratory. • Explain the factors that prevent intravascular coagulation • Explain the role of Calcium ions in Intrinsic and Extrinsic pathways • Enlist the vitamin K dependent clotting factors • Explain the prothrombin time, (INR) International Normalized Ratio , and its clinical significance.
	Coagulation disorders	• Enlist and explain the conditions that cause excessive bleeding • Define thrombocytopenia • Enlist the causes and consequences of Thrombocytopenia

	Immunity	• Define immunity • Classify immunity • Explain humoral immunity • Explain innate immunity. • Elaborate cell mediated immunity. • Describe the structure of antigen and immunoglobulin • Describe the role of Helper T-cells in cell mediated immunity • Enlist the types of Immunoglobulins along with their functions • Explain the role of memory cells in enhancing • antibody response (secondary response) • Describe the mechanism of action of antibodies • Elaborate the complement system.
	Tolerance	• Elaborate Immune tolerance • Explain the process of clone selection during T cell processing • Discuss the failure of tolerance mechanism
	Immunization	• Discuss immunization. • Define passive Immunity • Explain features and physiological basis of delayed reaction allergy. • Explain features and physiological basis of Atopic Allergy • Explain features and physiological basis of Anaphylaxis, urticarial and Hay fever.
	Blood group Incompatibility	• Discuss the pathophysiology, features and treatment of ABO and RH incompatibility • Enlist the changes that take place in the stored Blood
	Blood mismatch Transfusion reactions	• Discuss the features and complications of mismatched blood transfusion reaction • Elaborate the Transplantation of Tissues and Organs

	Transplantation of tissues	• Explain the process of tissue typing • Explain the prevention of Graft Rejection by suppressing immune system

➢ Medical Biochemistry

Topic	Sub Topic	Learning objectives
Medical Biochemistry	Hemoglobin and its types/ RBCs	• Explain the steps of synthesis of hemoglobin and interpret Porphyrias on basis of sign symptoms and data. • Discuss the biochemical role and types of hemoglobin **a)** Differentiate Hemoglobin and myoglobin **b)** Explain oxygen dissociation curve of hemoglobin and myoglobin and factors regulating them **c)** Interpret Carbon monoxide CO toxicity on basis of sign and symptoms **d)** Explain the role of Bisphosphoglycerate (2,3 BPG) in fetal circulation
	Hemoglobinopathies/ RBCs/ Homeostasis	• Discuss haemoglobinopathies and their biochemical and genetic basis with special emphasis on sickle cell anemia, Thalassemia and methemoglobinemia • Discuss the following types of anemia on the basis of signs and symptoms and laboratory data: **a)** Hypochromic microcytic **b)** Normochromic microcytic **c)** Normochromic normocytic **d)** Macrocytic (megaloblastic)

	Iron Metabolism/ RBCs	• Explain the iron metabolism with mechanism of absorption and factors affecting it. **a)** Interpret Iron deficiency anemia on basis of given data and microscopic findings **b)** Interpret folic acid and cobalamin in relation to anemias on given data and microscopic findings **c)** Discuss biochemical role of pyridoxine and vitamin C in microcytic anemia
	Heme Degradation/ RBCs	• Discuss the degradation of heme in macrophages of reticuloendothelial system **a)** Describe the formation of bile pigments, their types and transport **b)** Discuss the fate of bilirubin
	Hyperbilirubinemias / RBCs/ Blood Groups	• Discuss hyperbilirubinemias and their biochemical basis **a)** Differentiate types of jaundice on basis of sign/symptoms and data **b)** Evaluate the genetic basis of jaundice on the basis of lab investigations
	Genetics	• Explain and interpret pedigree of single gene defect i.e. sickle cell anemia (Autosomal recessive) and Beta Thalassemia (x linked recessive)

➢ Pathophysiology and Pharmacotherapeutics

Topic	Sub Topic	Learning objectives
Pharmacology & Therapeutic	Anemia	• Describe the oral and parenteral iron preparations including their pharmacokinetics, uses, adverse effects and Iron Antidotes. • Vitamin B12 preparations.
Pathology	Blood Cells, Platelets and Blood Group	• Define the terms: Hematopoietic growth factors, their name, mechanism of actions, uses and adverse effects

		• Define and classify anemias according to underlying mechanism and MCV/MCH
		• Discuss the causes and investigations of iron deficiency anemia and megaloblastic anemia • Classify the benign and malignant disorders of WBCs • Discuss the causes leading to reactive leukocytosis • Interpretation of anemias on the basis of peripheral blood smear and bone marrow findings • Classify bleeding disorders • Discuss first line laboratory investigations for bleeding disorders • Describe the basic concept of blood grouping and acute hemolytic transfusion reaction

➢ **Disease Prevention & impact**

Topic	Sub Topic	Learning objectives
Community Medicine and Public Health	Anemia	• Describe the nutritional aspects of iron deficiency • anemia and psychological aspects of diseases
	Communicable diseases	• Enlist most common blood borne diseases in Pakistan • Describe the routes of spread of blood borne diseases
	Genetic diseases	• Genetic counseling of parents
Behavioral Sciences	Counselling, informational care	• Psychological Counselling of patients and their families

	Personal, Psychosocial and vocational issues	• Identify and deal with the various psychosocial aspects of Hematopoietic System disorders (such as Sickle Cell Disease, Hemophilia, and Conditions of the Blood) on Individual, Family and Society.

➢ Aging

Topic	Sub Topic	Learning objectives
Aging	Platelet Rich Plasma Therapy	• Discuss the role of platelets in Platelet Rich Plasma (PRP) treatment in old age (for skin, hairs and joints)
	Glutathione	• Explain the role of glutathione in skin whitening

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6.3.2. Skills

➢ **Practical's**

Topic	Sub Topic	Learning objectives
Histology	Histological features of lymph node, spleen & thymus	• Light microscopic structure of Spleen, Thymus, Lymph nodes, tonsils and Mucosa Associated Lymphoid Tissue (MALT) including Appendix.
Biochemistry	Jaundice & Anemias	• Estimate serum bilirubin and interpret types of jaundice on the basis of data. • Estimate serum ALP level • Estimate serum AST level • Estimate serum ALT level
Physiology	Jaundice & Anemias/ RBCs/ Homeostasis	• Interpret the report of Red Blood Cell Count, Hemoglobin concentration, Hematocrit and RBC Indices by Automated Cell Counter • Interpret the Total Leucocyte Count, Differential Leucocyte Count Platelet Count by Automated Cell Counter.
	Bleeding/ Clotting time	• Determine Bleeding Time. • Determine Clotting Time.

6.3.3. C-FRC for Hematopoietic and Lymphatic Module

HEMATOPOEITC AND LYMPHATIC MODULE		
Objectives	**Skill**	**Miller's Pyramid Level Reflected**
Detail the steps of drawing blood from a vein.	*Venipuncture and blood collection	Knows how
Check for pallor in the conjunctiva, tongue, and palm of hands	Pallor	Shows

7. Attitude

➢ PERL's for Block-I

FOUNDATION-I				
*Proposed Sequence of Topics Mentioned below. Medical Colleges are at liberty to manage according to their resources. Topics can switch within each Block				Total Hours = 7.5
*Research (R) in the PERL curriculum will be delivered by the Department of Community Medicine as a longitudinal component from the first to the fourth year of the MBBS program. At the end of the fourth year, students' research projects will be assessed through a dedicated PERL station.				
Code	**Domain**	**Topic**	**Specific Learning Objectives**	**Proposed Portfolio Entry**
PERLs-1-008	Professionalism	Introduction of medical Professionalism	• Define Medical Professionalism • Discuss Core Values: Altruism, Accountability, Integrity • Explain Ethical Practice and Moral Responsibility Reflect on a scenario or case study that demonstrates professionalism in healthcare, identifying key behaviours and attitudes that align with professional standards	Submit a reflective entry discussing what professionalism means in the context of healthcare. Use a case or example to highlight key professional behaviours you observed or practiced.
PERLs-1-009		Responsible & Accountable Medical Student	• Understand the importance of responsibility and accountability in maintaining regularity and punctuality as core professional behaviors expected of medical students. • Demonstrating regular attendance and punctuality in academic and clinical activities, reflecting on how this consistency contributes to their professional development.	Evidence of Attendance Record.

PERLs-1-011	Leadership	Personal Qualities: Self Directed Learner	• Develop the ability to become a self-directed learner by setting achievable long-term and short-term goals and effectively managing time to meet academic and personal milestones. • Create a personal plan that includes both long-term and short-term academic goals and a weekly time schedule to help manage their studies and personal responsibilities.	Submit a personal learning plan outlining your long-term and short-term goals, as well as a detailed weekly time schedule. Reflect on how this plan will support your academic success and personal development as a self-directed learner
PERLs-1-012		Verbal Communication	• Develop effective verbal communication skills, focusing on clear and concise communication in academic, clinical, and team-based settings to enhance collaboration and leadership abilities. • Practice delivering clear and concise verbal explanations of medical concepts or tasks during group activities, focusing on tone, clarity, and engagement with peers	Submit a reflection on a group activity where you practiced verbal communication skills. Highlight how you conveyed information clearly and effectively, and reflect on areas where you can improve your verbal communication in academic or clinical settings.

HEMATOPOETIC & LYMPHATIC				
*Proposed Sequence of Topics Mentioned below. Medical Colleges are at liberty to manage according to their resources. Topics can switch within each Block				**Total Hours =03**
***Research (R)** in the PERL curriculum will be delivered by the Department of Community Medicine as a longitudinal component from the first to the fourth year of the MBBS program. At the end of the fourth year, students' research projects will be assessed through a dedicated PERL station.*				
Code	**Domain**	**Topic**	**Specific Learning Objectives**	**Proposed Portfolio Entry**
PERLs-1-013	**Leadership**	Non-Verbal Communication	• Discuss the role of non-verbal communication, including body language, facial expressions, and gestures, in effectively conveying messages and building rapport in healthcare settings • Practice using appropriate non-verbal communication during simulated patient interactions or group discussions, such as eye contact, posture, and active listening cues.	Submit a reflection on a group activity or simulated interaction where you consciously used non-verbal communication to enhance the interaction. Discuss how it impacted your ability to lead or communicate effectively
PERLs-1-014	**Research**	Scientific Writing	• Differentiate between types of scientific publications, including editorials, original articles, systematic reviews, case reports, meta-analyses, and narrative reviews. • Identify different forms of scientific writing in published journals.	

ASSESSMENT POLCIY AND TOS OF UHS

8. Teaching & Learning Methodologies

- **Interactive Lectures**

  Interactive lecturing involves an increased interchange between teachers, students and the lecture content. The use of interactive lectures can promote active learning, heighten attention and motivation, give feedback to the teacher and the student, and increase satisfaction for both.

- **Small group discussions**

  Small-group discussion is a student-centered methodology that allows students to actively involve and be partners in the teaching-learning process. Students interact with peers and instructors, discussing, and sharing ideas. They develop the ability to build consensus in a group.

- **Practical's**

  Hands-on performance of skills in laboratory

- **Clinical Skills Session**

- Clinical skills are abilities health care professionals use when assessing, diagnosing and caring for patients. Clinical skills also describe applied medical knowledge, such as assessing bloodwork.

- **Case based Learning**

  Case-based learning is a student-centered learning approach where students read and discuss complex situations and apply their knowledge to each situation. Students typically examine the case together as a team and address the problems within the realistic scenario to develop a reasonable conclusion.

- **Problem Based Learning**

  Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. This problem is what drives the motivation and the learning.

- **Self-directed learning**

  Self-directed learning is an instructional strategy where the students with guidance from the teacher decide what and how they will learn. It can be done individually or with group, learning, but the overall concept is that students take honor ship of their learning

9. Assessment Methodologies

1. Theory

- **MCQ's**

A multiple-choice question (MCQ) is composed of two parts: a stem that identifies the question or problem, and a set of alternatives or possible answers that contain a key that is the best answer to the question, and a number of distractors that are plausible but incorrect answers to the question.

2. Practical

- **OSPE**

"Objectively Structured Practical Examination.", as a tool for the assessment of practical skills of undergraduate Medical Students.

- **OSCE**

OSCE stands for "Objectively Structured Clinical Examination." OSCEs are very helpful in medical education because they allow a student to practice and demonstrate clinical skills in a standardized medical scenario.

3. OSVE

OSVE stands for "Objectively Structured Viva Examination". In the viva you have to answer questions and engage with your examiners.

10. Assessment Policy (UHS)

Regulations

1. Professional examination shall be open to any student who: -
   - **a.** Has been enrolled/registered and completed one academic year preceding the concerned professional examination in a constituent/affiliated college of the University.
   - **b.** Has his/her name submitted to the Controller of Examinations, for the purpose of examination, by the Principal of the college in which he / she is enrolled & is eligible as per all prerequisites of the examination?
   - **c.** Has his/her marks of internal assessment in all the Blocks/Clinical Clerkships sent to the Controller of Examinations through office of the Principal of the concerned college, at the end of each Block/Clinical Clerkships, as well as at the conclusion of the academic session along with the admission form for the professional examination.
   - **d.** Has been certified by the principal of his/her college:
     - **i.** of good character;
     - **ii.** of having attended not less than cumulative 75%* of the full course of lectures delivered, practical and clinical rotations conducted in the particular academic session, while maintaining 75 % attendance in each Block/Clinical Clerkship,
     - **iii.** of having appeared at the Block/Clinical Clerkship Examinations conducted by the college of enrolment with at least 50 % marks* in each Block/Clinical Clerkship examination, as well as in aggregate score of all Blocks/Clinical Clerkships examinations for the concerned year;
2. Written/Theory paper in all Professional Examinations in Modular Integrated MBBS or BDS Curricula shall consist of MCQs alone, with effect from Annual 2026 Examinations. (Ref: No. UHS/REG-25/2379, dated 17.11.2025)
3. The minimum number of marks required to pass the professional examination for each Block/Clinical Clerkship shall be fifty percent (50%) in Written and fifty percent (50%) in the 'Oral/Practical/Clinical' examinations and fifty percent (50%) in aggregate, independently and concomitantly, at one and the same time.
4. A candidate failing in one or more Blocks/Clinical Clerkships in the annual examination shall be provisionally allowed to join the next professional class till the commencement of supplementary examinations. The candidate, however, shall have to pass the failed Block/s

or Clinical Clerkship in this supplementary examination failing which he / she shall be detained in the professional year. Under no circumstances, a candidate shall be promoted to the next professional class till he/she has previously passed all the Blocks/Clinical Clerkships in the preceding professional examination.

If a student appears in the Supplementary Examination for the first time as he/she did not appear in the annual examination for any reason and failed in any Block/Clinical Clerkship in the Supplementary Examination, he/she will be detained in the same class and will not be promoted to the next class.

*Notification No.UHS/REG-25/2351 Dated 13-11-2025

5. Only one annual and one supplementary of each Professional Examination shall be allowed in a particular academic session. However, in exceptional situations, i.e., national calamities, war or loss of solved answer books in case of accident, special examination may be arranged after having observed due process of law. This will require permission of relevant authorities, i.e., Syndicate and Board of Governors.
6. Any student who fails to clear the First or Second Professional MBBS / First Professional BDS Examination, in four consecutive attempts, each, inclusive of both availed as well as un-availed attempts, after becoming eligible for the examination, and has been expelled on that account shall not be eligible for continuation of studies and shall not be eligible for admission as a fresh candidate in either MBBS or BDS.
7. The application for admission of each candidate to the professional examination shall be submitted to the Controller of Examination, through the Principal of the College, on the prescribed format, as per notified schedule, accompanied by the prescribed fee.
8. The candidates shall pay their fee through the principal of their respective Colleges, who shall forward the Examination Forms along with the duly paid challan of the examination fee generated from the Online Examination Form.
9. The continuous internal assessment through the Block/Clinical Clerkship, conducted by the college of enrollment, shall carry 20% weightage in the total allocated marks for the concerned Block/Clinical Clerkship in the Professional Examination conducted by the university. The score will be equally distributed to the Written and “Oral/Practical/Clinical” Examinations.

10. The marks of internal assessment through Blocks/Clinical Clerkships examination and attendance record shall be submitted to Controller of Examinations, along with question papers and keys for the Block/Clinical Clerkship examination, within two weeks of completion of each Blocks/Clinical Clerkships examination.

Further, parent-teacher meetings shall be arranged by the colleges after every Block/Clinical Clerkship examination to share feedback on the progress of students with their parents. Minutes of parent teacher meetings, academic timetables/schedule of Blocks/Clinical Clerkships and academic year study guides shall be submitted to the Department of Medical Education UHS, as well.

11. It is emphasized that fresh internal assessment or a revision of assessment for supplementary examination shall not be permissible. However, a revised internal assessment for the detained students can be submitted. The internal assessment award in a particular year will not be decreased subsequently detrimental to the detainee candidate. A proper record of the continuous internal assessment shall be maintained by the concerned department/s in the colleges.

12. The colleges may arrange remedial classes and one re-sit for each Block/Clinical Clerkship examination after fulfillment of prescribed requirements given below. The remedial classes and re-sit examination can be conducted during summer vacation/weekends, before or during preparatory leave for the concerned professional examination, subject to the following conditions:

Block/Clinical Clerkship Attendance	Remedial Classes
<75%, ≥ 50% (50-74%)	**1.** Principal of the college may conduct remedial classes and submit result to the Examination Department, UHS, independently. **2.** Principal of the college may conduct remedial classes for detained students, who have short attendance in the first Block/Clinical Clerkship of a professional year after detention. The college may submit record of the remedial classes to the Examination Department, UHS, independently.

<50%	**1.** Principal of the college may submit attendance record of such students to Department of Medical Education, UHS, and seeking permission for conduct of remedial Classes. The conduct of remedial classes in such cases shall be arranged only after permission from the Competent **2.** Authority in the university. **3.** The colleges shall also have to provide the university with the reasons submitted by the candidates for short attendance along with documentary evidence for the same duly verified by the principal. **4.** The following shall be considered as valid reasons for short attendance of the students for consideration of permission for remedial classes: **a.** Illness/accident/surgery of the student or sickness/death of an immediate relative/being afflicted by a natural/man-made calamity or disaster or detained students (missed the first Block/Clinical Clerkship of the year), students clearing their preceding professional examination in supplementary, or late **b.** admitted students who have been permitted for joining by UHS

Marks in Block/ Clinical Clerkship Examination	**Re-sit Examination**
<50% Marks/ Absence from Block /Clinical Clerkship Examination	**1.** Principal of the college may submit record of such students to Department of Medical Education, UHS, and seeking permission for conduct of re-sit examination. **2.** The conduct of re-sit examination in all cases shall be arranged only after permission from the Competent Authority in the university.

	3. The colleges shall also have to provide the university with the reasons submitted by the candidates for absence from the Block/Clinical Clerkship examination, along with documentary evidence for the same duly verified by the principal. **4.** The following shall be considered as valid reasons for absence of a student from Block/Clinical Clerkship examination, and for consideration of permission for re-sit examination: **a.** Illness/accident/surgery of the student or sickness/death of an immediate relative/being afflicted by a natural/man-made calamity or disaster or detained students (missed the first **b.** Block/Clinical Clerkship of the year), students clearing their preceding professional examination in supplementary, or late admitted students who have been permitted for joining by UHS

13. The following policy shall be applicable for transition of students From Traditional Subject-Based Scheme to the Modular Integrated Curriculum Scheme:

a. The students who fail in all subjects of the professional examination, either by taking the examination or due to non-appearance, and are detained in the respective professional year, shall follow the Modular Integrated Curriculum Scheme for their teaching and assessment.

b. The students who fail in one or more subjects but not all the subjects of a professional examination, either by taking the examination or due to non- appearance, and are detained in the respective professional year, shall attend classes with students following the Modular Integrated Curriculum Scheme, but they will be examined in the failed subject/s according to their parent scheme, i.e., the Traditional Subject-Based Curriculum Scheme.

MBBS YEAR-1						
Subject	**Theory**		**Practical**			**Total**
Block 1 **Modules** (Foundation-I + Hematopoietic and Lymphatic)	Part I MCQs (140)	140 Marks	Practical /Clinical Examination	011 OSPE 02 OSCE 03 OSVE	**Marks** 88 10 42	**350**
	Internal Assessment 10%	35 Marks	Internal Assessment 10%	35 Marks		
	Total	**175**	Total	**175**		
Block 2 **Modules** (Musculoskeletal & Locomotion-I)	Part I MCQs (140)	140 Marks	Practical /Clinical Examination	11 OSPE 02 OSCE 03 OSVE	**Marks** 88 10 42	**350**
	Internal Assessment 10%	35 Marks	Internal Assessment 10%	35 Marks		
	Total	**175**	Total	**175**		
Block 3 **Modules** (Cardiovascular-I & Respiratory-I)	Part I MCQs (140)	140 Marks	Practical /Clinical Examination	11 OSPE 02 OSCE 03 OSVE	Marks 88 10 42	**350**
	Internal Assessment 10%	35 Marks	Internal Assessment 10%	35 Marks		
	Total	**175**	Total	**175**		
					Total Marks:	**1050**

11. Examination Rules AFMDC

- Students must report to examination hall/ venue at least 30 minutes before the exam.
- Exam will start sharp at time.
- Late comers arriving at the examination hall more than 15 minutes after the start of the paper will not be allowed to enter the examination hall.
- All students should wear Lab coats before appearing in the exam.
- Students are not allowed to take into the examination hall textbooks, notes or manuscript of any kind.
- Students must bring the necessary stationary items for exam with them e.g. pen/pencil/eraser/ball point/sharpener etc.
- Mobile phones and gadgets are strictly prohibited in examination hall. If any student found with Mobile Phone (Silent/Switched off/on) he/she will not be allowed to continue the exam.

12. Internal Assessment Policy (UHS)

It shall constitute 20% of the total assessment at the end of the academic year.

	Scoring Parameter	Weightage (percentage)
Theory 10 %	Attendance	75% attendance -1 % >85% attendance -2 %
	Block Exam	5 %
	Continuous assessment	3 %
Practical 10 %	Attendance	75% attendance -1 % >85% attendance -2 %
	Block Exam	5 %
	Clinical logbooks	3 %

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13. Table of Specification (TOS)

Theme	Subject	Written Exam		Oral/Practical/Clinical Exam			
		MCQ (1 mark)	Marks	OSPE (8 marks each observed)	OSCE (5 marks each observed)	OSVE (14 marks each observed)	Marks
Normal Structure	Anatomy applied/clinical	40	40	04	-	01	46
Normal Function	Physiology applied/clinical	37	37	03	-	01	38
	Biochemistry applied/clinical	34	34	02	-	01	30
Disease Burden & Prevention	Community Medicine & Public Health	06	06	-	-	-	-
	Behavioral Sciences	05	05	-	-	-	-
Pathophysiology & pharmacotherapeutics	Pathology	13	13	1	-	-	8
	Pharmacology	05	05	1	-	-	8
CFRC	CF-I	-	-	-	01	-	05
PERLs	PERLs-I	-	-	-	01	-	05
Total		140	140	11 stations x 08 = 88	02 stations x 05 = 10	03 stations x 14=42	140

14. Frame work of Block-1 Module Timetable 2025-26

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TIME TABLE FRAMEWORK 1st YEAR MBBS CLASS SESSION Block I 2025-26

DAY	1 08:00 am - 09:00 am	2 09:00 am - 10:30 am	3 10:30 am - 11:30 am	4 11:30 am - 12:30 pm	5 12:30 pm - 01:00 pm	6 01:00 pm - 02:00 pm
Monday	Embryology Lecture	Practical Group A: Anatomy Group B: Biochemistry Group C: Physiology	Physiology Lecture	General Histology Lecture	Break/Namaz Break	Community Medicine Lecture
Tuesday	Biochemistry Lecture	Practical Group B: Anatomy Group C: Biochemistry Group A: Physiology	Physiology Lecture	Embryology Lecture		Community Medicine Lecture
Wednesday	Physiology Lecture	Practical Group C: Anatomy Group A: Biochemistry Group B: Physiology	Embryology Lecture	PERL's Lecture		Pathology Lecture
Thursday	Biochemistry Lecture	SGD Group A: Anatomy Group B: Biochemistry Group C: Physiology	General Anatomy Lecture	Embryology Lecture		Pathology Lecture
DAY	1 08:00 am - 09:00 am	2 09:00 am - 10:30 am	3 10:30 am - 11:30 am	4 11:30 am - 12:00 pm	5 12:00 pm - 01:00 pm	Jummah Prayers
Friday	Embryology Lecture	SGD Group B: Anatomy Group C: Biochemistry Group A: Physiology	General Anatomy Lecture	SDL	Physiology Lecture	
DAY	1 08:00 am - 09:00 am	2 09:00 am - 10:30 am	3 10:30 am - 11:30 am	4 11:30 am - 12:30 pm	5 12:30 pm - 01:00 pm	6 01:00 pm - 02:00 pm
Saturday	Physiology Lecture	SGD Group C: Anatomy Group A: Biochemistry Group B: Physiology	Biochemistry Lecture	General Histology Lecture	Break/Namaz Break	BS/Pharamcology Lecture

Note: In SDL Students are directed to visit library for self learning or they can visit their respective teachers for clarification of their concepts regarding subjects.

RESOURCE BOOKS

15. Learning Resources

Anatomy	• Snell's Clinical Anatomy 10th ed. • Langman's Medical Embryology 12th ed • Medical Histology by Laiq Hussain Siddiqui 8th ed. • General Anatomy by Laiq Hussain Siddiqui 6th ed.
Physiology	• Guyton AC and Hall JE. Textbook of Medical Physiology, W.B. Saunders & Co. Philadelphia • Essentials of Medical Physiology by Mushtaq Ahmad
Biochemistry	• Harpers illustrated Biochemistry 32nd edition. Rodwell.V.W MCGrawHill publishers. • Lippincott illustrated Review 8th edition Kluwer.W. • Essentials of Medical Biochemistry vol 1&2 by Mushtaq Ahmed.
Community Medicine	• Parks TextBook of Preventive and Social Medicine, K. Park(Editor) • Public Health and Community Medicine Ilyas Ansari(Editors)
Pharmacology	• Basic and clinical Pharmacology by Katzung. McGraw-Hill • Pharmacology by Champe and Harvey, Lippincott Williams & Wilkins
Pathology	• Vinary Kumar, Abul K. Abbas and Nelson Fausto Robbins and Cotran, Pathologic basis of disease. WB Saunders. • Richard Mitchall, Vinary Kumar, Abul K. Abbas and Nelson Fausto Robbins and • Cotran, Pocket Companion to Pathologic basis of diseases. Saunder Harcourt. • Walter and Israel. General Pathology. • Churchill Livingstone.
Medicine	• Davidson's Principles and Practice of Medicine
Surgery	• Bailey & Love Short Practice of Surgery
Islamiyat	• Standard Islamiyat (compulsory) for B.A, B.Sc, MA, Msc, MBBS by Prof. M Sharif Islahi • Ilmi Islamiyat (compulsory) mfor B.A, B.sc & equilent.
Behavioral Sciences	• Handbook of Behaioural Sciences by Prof. Mowadat H. Rana, 3rd Edition. • Medical and Psychosocial Aspects of Chronic illness and Disability Sixth Edition Donna R. Falvo, PHD Beverley E. Holland, PHD RN.