LAHORE
MEDICAL & DENTAL
COLLEGE

STUDY GUIDE

BLOCK 1

(FOUNDATION-1 MODULE, HEMATOPOIETIC & LYMPHATIC MODULE)

FOR

FIRST YEAR MBBS

2024

TABLE OF CONTENTS

I. LIST OF ABBREVIATIONS

A	Anatomy
Ag	Aging
B	Biochemistry
BhS	Behavioral sciences
CM	Community Medicine
C-FRC	Clinical-Foundation Rotation Clerkship
F	Foundation
HL	Hematopoietic & Lymphatic
M	Medicine
P	Physiology
Pa	Pathology
Pe	Pediatrics
PERLs	Professionalism, Ethics, Research, Leadership
Ph	Pharmacology
Psy	Psychiatry
QI	Quran and Islamiyat
R	Radiology
S	Surgery

II. CURRICULUM FRAME WORK FOR YEAR 1

YEAR	MODULES	
YEAR 1	• Foundation-1 • Hematopoietic & Lymphatic	**Block 1**
	• Musculoskeletal & Locomotion-1	**Block 2**
	• Cardiovascular-1 • Respiratory-1	**Block 3**
	• PERLs-1 • Quran-1 • Islamiyat, Civics & Pakistan Studies	**Spiral**
	• Clinical Skills Foundation C-FRC-1 (Clinical-foundation, Rotation, Clerkships)	

III. INTRODUCTION TO THE STUDY GUIDE

As UHS has introduced modular integrated MBBS curriculum 2k23 from the academic session 2022-2023, and version 2.0 is released in 2k24, the study guide for Block-1 is developed in order to introduce the First year MBBS students to various modules and blocks in year 1. The learning objectives of all the subjects included in block-1 are added to help learners focus on key areas. Time tables for both the modules in block-1 are added and total contact hours for each subject are given in a tabulated manner. The books and other reading resources are mentioned to facilitate the students. Assessment tools, policy and schedule is also included. Moreover, table of specifications (TOS) for block-1 examination is added to facilitate the learners.

IV. INTRODUCTION TO THE BLOCK-1

Course name:

- Block-1

Year:

- Year-1

Level of students:

- First year MBBS

Duration of Block-1:

19th February 2024– 17th May 2024

- Foundation module-1: 19th February – 19th April
- H & L module: 22nd April – 17th May

V. BLOCK-1 COMMITTEES

A. Foundation Module committee:

Module coordinator

- Biochemistry (Prof. Rubina Bashir)

Module co-coordinator

- Prof. Sobia Imtiaz

Representatives

- Anatomy (Prof. Iffat Badar)
- Physiology (Dr. Sadia Nazir)
- Biochemistry (Prof. Sobia Imtiaz)
- Pharmacology (Prof. Ajaz Fatima, Dr. Amna Zubair)
- Pathology (Prof. Shazia, Dr. Maimoona)
- Medicine (Prof. Wasim Amer, Prof. Sarah Shoaib)
- Surgery (Prof Hasnat, Dr. Sidra Shoaib)
- Behavioral Science (Prof. Khalid Gill, Dr. Faraz Zafar, Miss Ramla)
- Community Medicine (Prof. Seema Daud, Dr. Humayun Mirza)
- Gynaecology & obstetrics (Prof. Nabeela Shami)
- Pediatrics (Prof. Rizwan, Dr. Madeeha)
- Deptt of Medical Education (Dr. Nighat Nadeem)

B. Hematopoietic & Lymphatic Module committee:

Module coordinator

- Biochemistry (Prof. Rubina Bashir)

Module co-coordinator

- Prof. Sobia Imtiaz

Representatives

- Anatomy (Prof. Iffat Badar)
- Physiology (Dr. Sadia Nazir)
- Biochemistry (Prof. Sobia Imtiaz)
- Pharmacology (Prof. Ajaz Fatima, Dr. Amna Zubair)
- Pathology (Prof. Shazia, Dr. Maimoona)
- Medicine (Prof. Wasim Amer, Prof. Sarah Shoaib)
- Surgery (Prof. Hasnat, Dr. Sidra Shoaib)
- Community Medicine (Prof. Seema Daud, Dr. Humayun Mirza)
- Gynaecology & obstetrics (Prof. Nabeela Shami)
- Pediatrics (Prof. Rizwan, Dr. Madeeha)
- Deptt of Medical Education (Dr. Nighat Nadeem)

TOR & Duties of Module Committees:

- Module committee was headed by module coordinator
- Module coordinator was nominated from the subject with the maximum content in the respective module
- Module coordinator developed module team for collaboration and consultation with all the relevant subjects
- Module committee assisted in implementation of the curricular guidelines provided by UHS
- Module committee coordinated with the assessment cell in medical education department.
- Module coordinator helped in developing the study guide in collaboration with medical education deptt

VI. TIME TABLES

FOUNDATION MODULE-1: 19th February – 19th April (8 weeks)

Days & time	*8:00 am-9:40 am	9:40 am-10:30 am	10:30 am-11:20 am	11:20 am-11:50 am	11:50 am-12:40 pm	12:40 pm-1:30 pm	1:30 pm-2:15 pm	2:15 pm-3:00 pm
Monday	Histo Practical A+B Physio Practical C+D Biochem Practical E+F Physio/Bio Tutorial G+H CSF I+J	Biochemistry lecture	Anatomy lecture	BREAK	Physiology lecture	Anatomy lecture	** Comm. Med/Aging	Pathology lecture
Tuesday	Histo Practical C+D Physio Practical E +F Biochem Practical G+H Physio/Bio Tutorial I+J CSF A+B	Biochemistry lecture	Anatomy lecture		Physiology lecture	Anatomy lecture	Pathology lecture	PERL lecture
Wednesday	Histo Practical E+F Physio Practical G+H Biochem Practical I+J Physio/Bio Tutorial A+B CSF C+D	Biochemistry lecture	Physiology lecture		Anatomy lecture	Anatomy lecture	Physiology lecture	Biochemistry lecture
Thursday	Histo Practical G+H Physio Practical I+J Biochem Practical A+B Physio/Bio Tutorial C+D CSF E+F	Anatomy lecture	Physiology lecture		Biochemistry lecture	Anatomy lecture	Behav. Sci lecture	*** Comm. Med/CSF
Friday	Histo Practical I+J Physio Practical A+B Biochem Practical C+D Physio/Bio Tutorial E+F CSF G+H	Physiology lecture	10:30 am-11:15 am	11:15 am- 11:30 am		11:30 am-12:15 am	12:15 am- 1:00 pm	
			Biochemistry lecture	BREAK		Anatomy lecture	**** Holy Quran/ Pharmacology	

*** SDL 40 minutes practical time**
**** Last Monday of module: aging**
***** Comm. Med/CSF on alternate weeks**
******Holy Quran /pharmacology on alternate weeks**

- **SDL on every Friday from 1:00 pm to 3:00 pm**

H & L MODULE: 22th April – 17th May (4 weeks)

Days & time	8:00 am-9:40 am	9:40 am-10:30 am	10:30 am-11:20 am	11:20 am-11:40 am	11:40 am-12:30 pm	12:30 pm-1:20 pm	1:20 pm-2:10 pm	2:10 pm-3:00 pm
Monday	Histo Practical/CSF[1] A+B Physio Practical C+D Biochem Practical E+F Physio Tutorial G+H Biochem Tutorial I+J	Physiology lecture	Biochemistry lecture	BREAK	Physiology lecture	Biochemistry/ Aging lecture	Preventive medicine[2]	Pathology/ CSF/ Behav Sci[3] lecture
Tuesday	Histo Practical/CSF[1] C+D Physio Practical E+F Biochem Practical G+H Physio Tutorial I+J Biochem Tutorial A+B	Physiology lecture	Biochemistry lecture		Physiology lecture	Biochemistry lecture	Pathology lecture	Pharmacology lecture
Wednesday	Histo Practical/CSF[1] E+F Physio Practical G+H Biochem Practical I+J Physio Tutorial A+B Biochem Tutorial C+D	Physiology lecture	Biochemistry lecture		Physiology lecture	Biochemistry lecture	PERL lecture	Pathology lecture
Thursday	Histo Practical/CSF[1] G+H Physio Practical I+J Biochem Practical A+B Physio Tutorial C+D Biochem Tutorial E+F	Physiology lecture	Biochemistry lecture		Physiology lecture	Biochemistry lecture	Anatomy lecture	Preventive medicine[2]
Friday	Histo Practical/CSF[1] I+J Physio Practical A+B Biochem Practical C+D Physio Tutorial E+F Biochem Tutorial G+H	9:40 am 10:25 am	10:25 am-11:10 am	11:10 am- 11:30 am		11:30 am-12:15 am	12:15 am- 1:00 pm	
		Physiology lecture	Biochemistry lecture	BREAK		Pathology/PERL[4] lecture	**** Islamiyat (Holy Quran) & Pak. studies	

- **SDL 40 minutes practical time**
- **SDL on every Friday from 1:00 pm to 3:00 pm**
- **CSF will be held in skills lab in practical time**

1 Histology practical/ CSF on alternate weeks
2 Preventive medicine will managed by community medicine and Behav sciences
3 First two weeks Pathology, third week CSF, Fourth week Behav sciences
4 First three weeks Pathology, last week PERL

VII. DISTRIBUTION AND DURATION OF TEACHING ACTIVITIES AMONGST DIFFERENT DISCIPLINES

FOUNDATION-1 MODULE:

- Anatomy (73 hours)
- Physiology (59 hours)
- Biochemistry (59 hours)
- Pharmacology (3 hours)
- Pathology (12 hours)
- Medicine & Surgery (CSF: 16 hours)
- PERL (6 hours)
- Community medicine (8.25 hours)
- Holy Quran (3 hours)
- Aging (0.75 hour)

S. No	Subject	Lecture	Practical	Tutorial	Grand Total
1	Anatomy	60 hours	13 hours	----------	73 hours
2	Physiology	39 hours	13 hours	7 hours	59 hours
3	Biochemistry	39 hours	13 hours	7 hours	59 hours
4	Pharmacology	03 hours	--------	--------	03 hours
5	Pathology	12 hours	--------	--------	12 hours
6	CSF	16 hours	--------	--------	16 hours
7	PERL	06 hours	--------	--------	06 hours
8	Community medicine	8.25 hours	--------	--------	8.25 hours
9	Holy Quran	03 hours	--------	--------	03 hours
10	Aging	0.75 hour	--------	--------	0.75 hour

H&L MODULE:

- Anatomy (7 hours)
- Physiology (43 hours)
- Biochemistry (43 hours)
- Pharmacology (3 hours)
- Pathology (11 hours)
- Medicine & Surgery (CSF: 04 hours)
- PERL (4 hours)
- Preventive/Community medicine/ Behavioral Sciences (7 hours)
- Holy Quran /Isl & Pak studies (3 hours)
- Aging (0.75 hour)

S. No	Subject	Lecture	Practical	Tutorial	Grand Total
1	Anatomy	3.5 hours	3.5 hours	----------	07 hours
2	Physiology	30 hours	6.5 hours	6.5 hours	43 hours
3	Biochemistry	30 hours	6.5 hours	6.5 hours	43 hours
4	Pharmacology	03 hours	--------	--------	03 hours
5	Pathology	11 hours	--------	--------	11 hours
6	Medicine & Surgery (CSF)	04 hours	--------	--------	04 hours
7	PERL	04 hours	--------	--------	04 hours
8	Preventive/C. med/ Behav. Sci.	07 hours	--------	--------	07 hours
9	Holy Quran/Isl & Pak studies	03 hours	--------	--------	03 hours
10	Aging	0.75 hour	--------	--------	0.75 hour

VIII. LEARNING OUTCOMES AND THEMES OF BLOCK-1

FOUNDATION-1 MODULE

Learning 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 bones, 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.

Themes

1. Cell structure
2. Cell transport and signaling
3. Cell chemistry
4. Homeostasis and blood
5. Autonomic nervous system
6. Body movement
7. Muscles
8. Growth and development

HEMATOPOIETIC AND LYMPHATIC MODULE

Learning outcomes

1. Explain the function of all the organs / structures involved in this system and the mechanisms controlling them (Spleen, lymph nodes, thymus, bone marrow, RBCs, WBCs, and platelets).
2. Explain the etiology and pathogenesis of common blood & lymphatic diseases, particularly those of importance in Pakistan.
3. Explain the rationale for the use of common therapeutic agents for the diseases related to blood and immunity.
4. Describe the role of immunity in the body.
5. Discuss the working & uses of laboratory instruments in diagnostic lab visit.
6. Relate red cell indices with health and disease.
7. Recognize ABO/Rh blood grouping system.
8. Describe the role of reticuloendothelial system in the body.
9. Describe the events of hemostasis.
10. Extrapolate the biochemical aspects of plasma proteins.
11. Discuss the pharmacological treatment of iron deficiency anemia.
12. Discuss blood composition and functions.
13. Discuss the role of liver in hemolytic anemia.
14. Practice history taking of a patient presented with blood disorders.

Themes

1. Red blood cell
2. Platelets
3. White blood cell

Clinical relevance

1. Aplastic anemia
2. Hemolytic anemia
3. Blood loss anemia
4. Nutritional anemia
5. Polycythemia
6. Hemoglobinopathies
7. Jaundice
8. Acute and chronic lymphocytic and myelogenous leukemia

9. Allergy (Type I, Type II & Type III)

IX. LEARNING OBJECTIVES (UHS SYLLABUS) OF BLOCK-1

FOUNDATION-1 MODULE

NORMAL STRUCTURE

GROSS ANATOMY

General Anatomy

FA-001: 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.

FA-002: Bones (Osteology)

- Describe, identify, and exemplify the general morphological features of bones.
- Describe the developmental classificationof bones.
- Describe the regional classification of bones.
- Describe the structural classification of bones.
- Describe the morphological classification of bones.
- Describe and exemplify sesamoid, pneumatic, wormian and heterotopic bones.
- Describe the classification of bones on the basis of osteogenesis.
- Describe the relationship of growing end of bones with the direction of nutrient foramen.
- Describe the blood supply, innervation and lymphatic drainage of various types of bones.
- Describe the use of bone tissue for bone marrow biopsy and bone grafting.
- Describe the salient features of common types of fractures.

FA-003: Cartilage (Chondrology)

- Describe the general features of cartilage and its importance in gross anatomy.
- Describe the subtypes and gross features of hyaline cartilage.
- Describe the gross features of elastic cartilage.
- Describe the gross features of fibrocartilage.
- Differentiate between the three types of cartilages.

FA-004: Joints (Arthrology)

- Describe and exemplify the structural classification of joints (synovial, cartilaginous & fibrous) along with their sub-classification.
- Describe the components and features of a synovial joint.
- Describe the blood supply, innervation and lymphatic drainage of synovial joints, cartilaginous joints, and fibrous joints.

- List the factors stabilizing the synovial joint.
- Define common joint injuries and disease.

FA-005: Integumentary System

- Describe the structure and function of skin on the basis of its two layers; Epidermis and Dermis.
- Describe the surface irregularities of the skin.
- 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 correlates of skin. (Skin infections, sebaceous cyst, skin burns and skin grafting)

FA-006: Muscle tissue (Myology)

- Define Muscle
- Classify and describe muscle tissue based on structure, function and development.
- Describe somatic and visceral muscles.
- Describe and differentiate between 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 the methods of studying skeletal muscle activity.
- Describe and differentiate between the basic organization of innervation to skeletal, smooth, and cardiac muscle.
- Describe the structure of tendons.
- Describe the structure of synovial bursae.
- Describe the structure of raphe.
- Comprehend the meaning of paralysis, spasm, atrophy, hypertrophy, hyperplasia and regeneration in relation to muscle tissue.

FA-007: Vascular System (Angiology)

- Classify the types of blood circulation. Classify and exemplify various types of blood vessel.
- 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, lymphadenopathy and Lymphography.

FA-008: 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.
- Describe the gross and/or microscopicanatomy of the following structures: nerve, nerve fiber, ganglion, tract, fasciculus, funiculus and lemniscus.
- 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 and differentiate between sympathetic and parasympathetic nervous system.

FA-009: Imaging in Anatomy (Integrate with Radiology)

- Identify displacement of fracture segments of the bone
- Identify dislocation of joints
- Describe the basic concept behind taking a biopsy of a tissue.

EMBRYOLOGY & POST-NATAL DEVELOPMENT

Embryology

FA-010: Cell cycle and Gametogenesis

- 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
- List the structural chromosomal anomalies
- Describe the anatomical basis for structural chromosomal abnormalities
- Describe the anatomical basis for the structural and numerical chromosomal anomalies
- Describe the embryological basis for mosaicism
- Describe the embryological basis for teratoma
- Describe the clinical presentation of common numerical chromosomal abnormalities

FA-011: Spermatogenesis

- Describe the process of spermatogenesis and spermiogenesis
- Describe the embryological basis for abnormal gametes
- Discuss the embryological basis of male infertility

FA-012: Oogenesis (Integrate with Gynaecology)

- Describe the prenatal and postnatal maturation of oocyte

FA-013: Oogenesis

- Describe the significance of arrested development of oocyte
- Describe the hormonal control of oocyte maturation
- Discuss the embryological basis of female infertility

FA-014: Gametogenesis

- Compare and contrast oogenesis and spermatogenesis

FA-015: Female Reproductive organs

- Enlist and briefly describe the female reproductive organs

FA-016: Female reproductive cycle (Integrate with Gynaecology)

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
- Describethe anatomical and physiological basis of the followings:Mittelschmerz, anovulation, menopause
- Define menstrual cycle
- Describe the phases of menstrual cycle
- Describe the anatomical and physiological basis of an-ovulatory menstrual cycle

FA-017: Transportation of gametes (Integrate with Gynaecology)

- Describe the transportation of male and female gametes
- Describe viability of gametes
- Explain the anatomical basis of dispermy triploidy

FA-018: Fertilization

- Define fertilization
- Describe the phases of fertilization
- Draw and label a diagram illustrating the phases of fertilization

- Enumerate and describe the results of fertilization
- Describe the anatomical and physiological basis of gender determination of the embryo

FA-019: Contraception (Integrate with Physiology)

- Define contraception
- Explain the mechanisms of following contraceptive techniques:
  - Barrier methods
  - Hormonal methods
  - Intrauterine device (IUD)
  - Emergency contraceptive pills (ECPs)
  - Male and female sterilization

FA-020: Infertility & assisted reproductive techniques (Integrate with Gynaecology)

- Describe the anatomical and physiological basis of male and female infertility
- Describe the role of clomiphene citrate in inducing ovulation
- Define assisted reproductive techniques
- Describe the mechanisms of following reproductive techniques:
  - In vitro fertilization (IVF) and embryo transfer
  - Cryopreservation of embryo
  - Intra-cytoplasmic sperm injection (ICSI)
  - Assisted in vivo fertilization
  - Surrogacy
- Explain the correlation of multiple births with assisted reproductive techniques

FA-021: Cleavage, blastocyst formation

- Describe the process of cleavage of embryo and blastocyst formation
- Describe the differentiation of embryoblast into epiblast and hypoblast
- Describe the establishment of cranial-caudal embryonic axis
- Describe pre-implantation genetic diagnosis
- 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
- Describe the events and factors influencing the cleavage of zygote
- Describe the sequence of events pertaining to formation of blastocyst (Integrate with Gynaecology)
- Compare and contrast the villi (Integrate with Gynaecology)
- Describe the process of compaction
- Describe the formation of morula (division into inner and outer cell mass)
- Describe the anatomical basis for the preimplantation genetic diagnosis
- Describe the formation of amniotic cavity,embryonic disc, and umbilical vesicle
- Describe the formation of chorionic sac

FA-022: Implantation

- Describe the uterus at the time of implantation (decidual reaction)
- Illustrate the concept of implantation
- Describe the differentiation of inner and outer cell mass
- Describe the abnormal implantation/ extrauterine implantations
- Enumerate the factors responsible for inhibition of implantation

FA-023: Molar pregnancy

- Describe the molar pregnancy

FA-024: Utero-placental circulation

- Describe the establishment of utero-placental circulation

FA-025: Abortion (Integrate with Gynaecology)

- Describe the embryological basis of abortions and its types

FA-026: Gastrulation (Integrate with Embryology)

- Describe the formation and 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
- Describe the molecular factors responsible for gastrulation

FA-027: Formation of notochord

- Describe the invagination and movement of prenotochordal cells
- Describe the notochordal plate formation
- Describe the neurenteric 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

FA-028: 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 the molecular and genetic factors for the process of neurulation

FA-029: Mesodermal derivatives (Integrate with Pediatrics)

- Describe the differentiation of mesoderm into it's constituting components
- Describe the somite formation and its fate
- Describe the estimation of age by somites

- Describe the formation of intra-embryonic coelom

FA-030: Early development of CVS (Integrate with Cardiology)

- Describe the processes of vasculogenesis and angiogenesis
- Explain the features of primordial cardiovascular system
- Describe the anatomical justification for capillary hemangiomas

FA-031: Germ layer derivatives

- Enlist the derivatives of germ layers

FA-032: Chorionic Villi

- Describe the formation and functions of chorionic villi

FA-033: Folding of embryo (Integrate with Gynaecology)

- Describe the cephalo-caudal folding
- Describe the lateral folding

FA-034: Germ layer derivatives

- Enlist and describe the derivatives of intermediate and lateral plate mesoderm
- Enlist and describe the derivatives of endoderm
- Enlist and describe the derivatives of ectoderm (Integrate with Gynaecology/Pediatrics)

FA-035: Control of the embryonic development

- Describe the factors influencing the embryonic development

FA-036: Folding of Embryo: Embryonic period

- Enlist the characteristic features of the embryo during 4th-8th weeks.
- Describe the criteria for estimating the developmental staging in human embryos
- Explain the estimation of gestational and embryonic age

FA-037 and FA-037 a (Integrate with Gynaecology/Radiology)**:** Fetal period

- Explain the trimesters of pregnancy.
- Explain the estimation of fetal age
- Explain the measurement and characteristics of fetus.
- Describe the overview of the monthly changes in external appearance of fetus (9th-38th weeks)
- 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 and post maturity
- Tabulate the criteria for estimating fertilization age during the fetal period
- Describe the post maturity syndrome
- Describe the procedures for assessing fetal status
- Describe the clinical picture of IUGR and factors resulting in IUGR
- Correlate the levels of alpha fetoprotein assay and fetal anomalies

FA-038: Placenta (Integrate with Gynaecology)

- 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
- Describe the changes in the trophoblast leading to the development of placenta
- Describe the structure (macroscopic and microscopic) of placenta
- Enlist and 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
- Describe placenta as an allograft and as an invasive tumor-like structure
- Describe the placental anomalies and their clinical picture (placenta previa, placenta accreta, placenta percreta, battledore placenta, membranous placenta, pre-eclampsia)
- Describe the role of placenta as an allograft
- Describe the stages of labor

FA-039: Fetal membranes (Integrate with Gynaecology)

- 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
- Enlist the components 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 characteristic signs and symptoms of oligohydramnios and polyhydramnios and justify embryologically
- Explain the clinical picture of umbilical band syndrome and justify it embryologically
- Explain the formation and fate of umbilical vesicle (yolk sac)
- Explain the formation and fate of Allantois
- Describe the clinical picture of allantoic cyst and sinus and justify it embryologically

FA-040: Multiple pregnancies

- Describe the development of dizygotic twins
- Describe the development of monozygotic twins
- Describe the fetal membranes in twin pregnancy
- Describe the twin transfusion syndrome
- Explain the zygosity of the twins

- Describe the characteristics of various types of conjoined monozygotic twins

FA-041: Prenatal diagnosis and fetal therapy

- Describe the various methods of pre-natal diagnosis
- Describe the fetal therapy

FA-042: Molecular regulations and signaling pathways

- Define morphogens, protein kinases, notch delta pathway, transcription factors, epigenetics
- Define stem cells and pluripotency
- Define the human disorders associated with genetic mutations

FA-043: Teratogenicity

- Define teratology: classification and causes of birth defects
- Define genomic imprinting
- 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:
    - Drugs
    - Environmental agents
    - Chemicals and heavy metals
    - Infectious agents
    - Radiation
    - Hormones
    - Maternal diseases
- Describe the basis for male-mediated teratogens

Microscopic Anatomy (Histology and Pathology)

FA-044: Introduction to microscopy and staining techniques

- Describe different types of microscopies
- Describe staining methods and their significance
- Describe the basis of enzyme histochemistry

FA-045: Cell membrane

- Describe the electron microscopic structure and fluid mosaic model of plasma membrane
- Draw the fluid mosaic model of plasma membrane
- Draw and label the structure and function of glycocalyx coat and lipid raft
- 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 (Integrate with Pathology)
- Describe the signal reception and transduction through different routes (Integrate with Pathology)

- Tabulate the mechanisms of transport across the cell membrane (Integrate with Pathology)
- Explain the following disorders related to cell membrane: Pseudohypoparathyroidism and dwarfism (Integrate with Pathology)

FA-046: Cell organelles

- List the membranous and non- membranous cellular organelles
- Draw and label the light and electron microscopic structure and functions of the cellular organelles
- Describe the structure of the following cellular organelles and correlate with their function:
  - Ribosomes
  - Endoplasmic reticulum (rough and smooth)
  - Golgi apparatus
  - Lysosomes
  - Proteasomes
  - Mitochondria
  - Peroxisomes
- Describe the clinical presentation of lysosomal storage diseases and correlate with their histological basis
- Describe the structural components of cytoskeleton, and correlate them with their functions
- Explain the histological basis of immotile cilia syndrome

FA-046a (Integrate with Pathology)

- Describe the histological features of cytoplasmic inclusions

FA-046b (Integrate with Physiology)**:**

- Describe the structure of nuclear envelope and nuclear pores

FA-047: Cell nucleus

- Describe the structure of chromatin
- Describe the structure of chromosome
- Draw and label the structure of nucleolus
- Describe the structure of nucleolus
- Describe the structure and types of DNA and RNA
- Describe the histological basis for apoptosis and necrosis
- Describe the clinical presentation of the following diseases and correlate with its histology: (Integrate with Pathology)
  - Laminopathies
  - Malignancy
- Describe the correlation of cell cycle with the following diseases: (Integrate with Pathology)
  - Retinoblastoma

    - Malignancy
- Describe the histological structure and function of basement membrane (light and electron) (Integrate with Pathology)
- Describe the mechanism of ciliary movements (Integrate with Pathology)

FA-048: Epithelium

- 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
- Explain the correlation of intercellular junctions with the following diseases:
    - Gastric ulcer
    - Food poisoning
    - Pemphigus vulgaris

FA-048a: Epithelium (Integrate with Biochemistry)

- Describe the electron microscopic structure of the following apical cell surface specializations:
    - Microvilli
    - Stereo cilia
    - Cilia

FA-048b: Epithelium (Integrate with Pathology)

- Explain the correlation between the structure of microvilli and celiac disease
- Classify and exemplify the epithelia with their histological structure, locations and functions

FA-048c:

- 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
- Explain the histological basis of acne vulgaris (Integrate with Pathology)

FA-049: 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

- Explain the role of GAGs in formation of barrier against bacteria and the role of hyaluronidase in the breakdown of this barrier
- Describe the structure, distribution, and functions of the cells of macrophage-mononuclear phagocytic system (Integrate with Biochemistry/Physiology)
- Describe the role of macrophages in innate immunity (Integrate with Biochemistry/Physiology)
- Describe the types of adipose tissue (white & brown), their histogenesis, locations and function
- Explain the etiology of Marfan's syndrome (Integrate with Pathology)
- Describe lipid storage and mobilization in and from adipocytes and compare the brown and white adipose tissue (Integrate with Pathology)
- Explain the histological basis and clinical presentation of the following diseases in relation to adipocytes:
    - Lipoma
    - Obesity (with special emphasis on the role of leptin) (Integrate with Pathology)

PRACTICAL

General Anatomy

FA-050: 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.

Embryology

FA-051: 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, 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)
- Placenta and positional and implantational variations, umbilical cord and its contents
- Fetal features during fetal period. Determine age of fetus based on these features.

FA-052: Embryology (Integrate with Radiology)

- Describe the USG report for the:
  Fetal features, fetal age estimation, placental attachment with its variations and fetal membranes. Multiple pregnancies.

FA-053: Embryology (Integrate with Gynaecology)

- On gross examination of human placenta and umbilical cord, identify:
  - normal complete placenta and cord
  - placental structural variations
  - umbilical cord and anomalies of its attachment to placenta
  - contents of umbilical cord (umbilical vessels anomalies)

FA-054: Embryology (Integrate with Pediatrics)

- Identify the features of hemolytic disease of newborn, dizygotic and monozygotic twins and correlate them embryologically

FA-055: Embryology (Integrate with Gynaecology)

- Identify the protocols and procedural steps for amniocentesis and chorionic villus sampling (CVS) and correlate their significance in developmental defects.
- Correlate the role of alpha feto-protein assays in neural tube defects.

Histology

FA-056: Staining techniques

- Describe different types of staining techniques and their significance with special emphasis on H&E staining

FA-057: Microscope

- Identify and draw different parts of light microscope

FA-058: Cell shape

- Identify and demonstrate different cell shapes under the microscope

FA-059: Epithelium

- Identify and demonstrate under light microscope the following types of epithelia:
  - Simple squamous
  - Simple cuboidal
  - Simple columnar (ciliated & non-ciliated)
  - Pseudostratified columnar (ciliated & non- ciliated)
  - Stratified squamous (keratinized & non keratinized)
  - Stratified cuboidal
  - Stratified columnar
  - Transitional

FA-060: Epithelium

- Identify and demonstrate serous and mucous secreting glands under light microscope

FA-061: Connective tissue

- Identify and demonstrate the various types of connective tissue

MEDICAL PHYSIOLOGY

PHYSIOLOGY

FP-001: 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
- 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^+, K^+ and Cl^- 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.

FP-002: Blood

- Enumerate the functions of blood
- Explain the composition of blood
- Enumerate the plasma proteins
- Discuss functions of plasma proteins and describe the pathophysiology of edema

FP-003: 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 B_{12} and folic acid in maturation of red blood cell

FP-004: 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
- Enlist the abnormal types of hemoglobin

FP-005: White Blood Cells

- 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
- 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

FP-006: Blood Types

- Enumerate different blood group types
- Explain the basis of ABO and Rh blood system
- Explain the Landsteiner law

FP-007: Autonomic nervous system

- Discuss components of autonomic nervous system
- Explain the physiological anatomy of sympathetic and parasympathetic nervous system
- Describe the types of adrenergic and cholinergic receptors and their functions
- Explain the effects of sympathetic and parasympathetic on various organs/ system of body

PRACTICAL

FP-008: Consent

- Explain laboratory/clinical procedure to the subject.
- Obtain verbal consent from subject before starting a procedure.
- Reassure the subject after the procedure.

FP-009: RBCs

- Determine erythrocyte sedimentation rate and packed cell volume

FP-010: Blood Group

- Determination of blood group

FP-011: WBCs

- Interpret Total Leucocyte Count, Differential Leucocyte Count (normal & abnormal) in a CBC report generated by automated cell counter**.**

MEDICAL BIOCHEMISTRY

FB-001: Structure of cell

- Differentiate between different types of cells.
- Explain the concept of organization of cells to tissue, tissues to organ, organs to system.
- Differentiate between the eukaryotic and prokaryotic cells.

FB-002: 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:
    - Lipids
    - Carbohydrates
    - Proteins
- Explain why the cell membrane is called fluid mosaic model

FB-003: 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)
- Describe cell to cell adhesion

FB-004: Subcellular organelles

- Explain the biochemical markers and importance of subcellular organelles and their inherited disorders especially:
    - I- cell disease
    - Refsum's disease
    - Parkinsonism
    - Progeria

FB-005: Chemistry of purine and pyrimidines

- Describe the chemistry of purines and pyrimidines and their linkage in nucleic acid

synthesis and their metabolism

FB-006: DNA

- Discuss the organization of DNA with special reference to Watson and crick model, composition, structure, Chargaff's rule of base pairing and genetic coding
- Describe the structural forms of DNA

FB-007: RNA

- 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

FB-008: Nucleotides

- Explain the structure and nomenclature of nucleotides, biomedical importance of natural and synthetic analogues
- Interpret the role of synthetic analogues of nucleotides in medicine based on sign/symptoms and data e.g., Methotrexate, 5 Fluorouracil and Allopurinol.

FB-009: Chromosome

- Explain the higher organization of DNA.
- Difference between DNA, chromatid and chromosome

FB-010: Nucleotide Metabolism

- Illustrate de Novo and salvage pathways of purines and pyrimidines
- Describe the degradation of purine and pyrimidine nucleotides
- Interpret Lesch-Nyhan syndrome, gout and adenosine deaminase deficiency on given data

FB-011: Replication

- Describe in detail all the steps in prokaryotic DNA replication with emphasis on: Different proteins required, Primers, DNA polymerase; their different components and functions, initiation, elongation and termination of replication,
- Topoisomerases
- Describe in detail all the steps in eukaryotic DNA replication with emphasis on differences between pro- and eukaryotes

FB-012: DNA repair

- Describe DNA repair especially Xeroderma pigmentosa

FB-013: Transcription

- Explain the transcription in prokaryotes focusing on the following key points; RNA polymerase, its components and functions, initiation, elongation, and termination of transcription
- Illustrate the transcription in eukaryotes focusing on the differences between pro- and eukaryotic transcription and post transcriptional modifications
- Wobble hypothesis

FB-014: Translation

- Interpret the translation focusing on the following key points: initiation, elongation and termination and inhibition by drugs
- Describe Post-translational modifications of proteins

PRACTICAL

FB-015: Lab hazards

- Demonstrate the steps taken to prevent or rectify the Laboratory Hazards

FB-016: Cell

- Identify the structure of cells under microscope

FB-017: Cell organelles

- Identify the methods of isolation of cell organelles

FB-018: Equipment

- Identify the different parts of equipment i.e., centrifuge, microlab, electrophoresis

FB-019: Demonstration of techniques

- Demonstrate the basic principles, uses and working of centrifuge, chromatography, electrophoresis and spectrophotometer

PATHOLOGY

FPa-001: 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
- Compare apoptosis with necrosis
- Identify different types and mechanism of cellular adaptations to stress
- Discuss the mechanism and types of intracellular accumulations and pathological calcifications

FPa-002: Introduction to Microorganisms

- Enumerate the microbes causing infectious diseases
- Describe the structure of bacterial cell
- Differentiate cell walls of gram positive and gram- negative bacteria
- Compare the structure of bacterial cell and virus
- Discuss the growth curve of bacteria
- Enlist steps of viral replication
- Identify types of bacterial infections
- Enlist stages of bacterial pathogenesis
- Discuss the determinants of bacterial pathogenesis

FPa-003: Sterilization and 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 for sterilization

PHARMACOLOGY AND THERAPEUTICS

FPh-001: Absorption, Distribution, Metabolism and Excretion of drugs

- Definitions of Pharmacology, drug, pro-drug, placebo
- Active principles
- Sources of drugs
- Brief outline of absorption, distribution, metabolism and excretion

FPh-002: Basic terminologies of Pharmacology

- Definitions of receptor, agonist, partial agonist, inverse agonist, antagonist and types of receptors and second messengers
- Diagrammatic concept of signaling mechanisms

FPh-003: Autonomic System

- Pharmacological aspects of autonomic receptors (types of autonomic receptors, important sites and actions)

COMMUNITY MEDICINE & PUBLIC HEALTH

FCM-001: Concept of health

- Describe the changing concepts and new philosophy of health
- Explain responsibility for health

FCM-002: 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 and Human Development Index

FCM-003: Health indicators

- Describe the importance of health indicators
- Classify health indicators
- Calculate morbidity and mortality
- Describe disability indicators
- Compare indicators among countries

FCM-004: 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

FCM-005: 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

AGING

FAg-001: Process of Aging **(Integrate with Biochemistry)**

- Discuss telomeres and telomerase and their clinical significance in aging.

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

FBhS-001: 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

FBhS-002: Psychological Disorders

- Identify the burden of mental illness on the person, family and society
- Describe Intellectual disability, Mental Disorders and Personality Disorders

FBhS-003: Psychology and Disease

- Identify the role of psychosocial factors in various illnesses
- Describe psychosocial aspects of various system diseases such as CVS, CNS, GIT, respiration, renal, endocrine and cancer

FBhS-004: 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

FBhS-005: 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

FBhS-006: Stress

- Identify the various physiological effects of stress
- Explain ANS response to stress
- Describe behavioral manifestations of stress
- Stress related multiple sclerosis and autoimmune diseases

FOUNDATION MODULE CSF:

DEPTT OF SURGERY:

- Demonstrate steps of hand washing
- Demonstrate the process of wearing the gloves

DEPTT OF MEDICINE:

- Demonstrate the procedure of taking the pulse
- Record the respiratory rate of a patient
- Demonstrate the procedure of taking the blood pressure

HEMATOPOIETIC AND LYMPHATIC MODULE

NORMAL STRUCTURE

GROSS ANATOMY

Human Anatomy

HL-A-001: Hematopoietic and Lymphoid Tissue

- Identify and describe the components of the hematopoietic & lymphoid tissue and their functions
- Location, coverings, relations of spleen
- Origin, course branches and distribution of splenic artery
- Venous drainage of spleen, portal vein formation, tributaries, and areas of drainage.
- Location and relations of thymus
- Age related changes in thymus

Embryology and Postnatal development

HL-A-002: Developmental Anatomy of Spleen

- Intrauterine development of spleen

PRACTICAL

HL-A-003: Histological features of lymph node, spleen and thymus

- Light microscopic structure of spleen, thymus,lymph nodes, tonsils and MALT including appendix.

NORMAL FUNCTION

Medical Physiology

HL-P-001: Anemia

- Define anemia
- Classify anemia on the basis of morphology and cause
- Discuss the effects of anemia on the body

HL-P-002: Polycythemia

- Define polycythemia
- Explain types of polycythemias
- Discuss the effects of polycythemia on the body

HL-P-003: Hemostasis

- Define hemostasis
- Describe the mechanisms by which hemostasis is secured

HL-P-004: Platelets

- Discuss the characteristics and functions of platelets

- Explain the mechanism of formation of platelet plug

HL-P-005: Coagulation Factors

- Enlist the clotting factors in blood
- Explain the conversion of Prothrombin to Thrombin and 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, and its clinical significance.

HL-P-006: Coagulation disorders

- Enlist and explain the conditions that cause excessive bleeding
- Define thrombocytopenia (Integrate with Medicine)
- Enlist the causes and consequences of thrombocytopenia (Integrate with Medicine)

HL-P-007: 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.

HL-P- 008: Tolerance

- Elaborate immune tolerance
- Explain the process of clone selection during T cell processing
- Discuss the failure of tolerance mechanism

HL-P-009: 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, urticaria and Hay fever.

HL-P-010: Blood group Incompatibility (Integrate with Pathology)

- Discuss the pathophysiology, features and treatment of ABO and Rh incompatibility

HL-P-011: Blood mismatch transfusion reactions (Integrate with Pathology)

- Discuss the features and complications of mismatched blood transfusion reaction

- Elaborate the transplantation of tissues and organs

HL-P-012: Transplantation of tissues (Integrate with Nephrology)

- Explain the process of tissue typing
- Explain prevention of graft rejection by suppressing immune system

MEDICAL BIOCHEMISTRY

HL-B-001: Hemoglobin and its types/ RBCs

- Discuss the biochemical role and types of hemoglobin
- Differentiate between hemoglobin and myoglobin
- Explain oxygen dissociation curve of hemoglobin and myoglobin and factors regulating them
- Interpret CO toxicity on basis of signs and symptoms
- Explain the role of 2,3 BPG in fetal circulation

HL-B- 002: Hemoglobinopathies/ RBCs/ Homeostasis

- Discuss hemoglobinopathies 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:
    - Hypochromic microcytic
    - Normochromic microcytic
    - Normochromic normocytic
    - Macrocytic (megaloblastic)

HL-B-003: Iron Metabolism/RBCs (Integrate with Medicine)

- Explain the iron metabolism with mechanism of absorption and factors affecting it.
- Interpret iron deficiency anemia on basis of given data and microscopic findings
- Interpret folic acid and cobalamin deficiency in relation to anemias on given data and microscopic findings
- Discuss biochemical role of pyridoxine and vitamin C in microcytic anemia

HL-B- 004: Heme Degradation/ RBCs

- Discuss the degradation of heme in macrophages of reticuloendothelial system
    - Describe the formation of bile pigments, their types and transport
    - Discuss the fate of bilirubin

HL-B- 005: Hyperbilirubinemias / RBCs/ blood groups

- Discuss hyperbilirubinemias and their biochemical basis
    - Differentiate between types of jaundice on basis of signs/symptoms and data
    - Evaluate the genetic basis of jaundice on the basis of lab investigations

HL-B-006: Plasma Proteins/ Homeostasis

- Classify and explain the biomedical importance of each class of plasma proteins

HL-B-007: Immunoglobulins/ WBCs/Immunity

- 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 (ILs, TNFs, IFs, PDGF, and PAF).
- Interpret multiple myeloma on basis of given data

HL-B-008: Genetics

- Explain and interpret pedigree of single gene defect i.e. sickle cell anemia (Autosomal recessive) and beta Thalassemia (X-linked recessive)

PRACTICAL

Medical Physiology

HL-P-013: Blood Cells

- Interpret the 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.

HL-P-014: Bleeding/ Clotting time

- Determine bleeding time.
- Determine clotting time.

Medical Biochemistry

HL-B-009: Jaundice & Anemias/ RBCs/ Homeostasis

- Interpret jaundice on the basis of estimation of bilirubin
- Perform estimation of ALT and interpret the findings
- Perform estimation of AST and interpret the findings
- Perform estimation of ALP and interpret the findings
- Interpret graph based on oxy HB curve and 2,3-BPG
- Interpret different types of anemias & porphyrias on basis of signs/symptoms and data

PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS

Pharmacology & Therapeutics

HL-Ph-001: Anemia

- Describe the oral and parenteral iron preparations including their pharmacokinetics, uses, adverse effects
- Vitamin B_{12} preparations, Iron antidotes
- Should know the terms: Hematopoietic growth factors, their names, mechanism of actions, uses and adverse effects

Pathology

HL-Pa- 001: Blood Cells, Platelets and blood groups

- 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 AND IMPACT

Community Medicine and Public Health

HL-CM- 001: Anemia

- Describe the nutritional aspects of iron deficiency anemia and psychological aspects of diseases

HL-CM- 002: Communicable diseases

- Enlist most common blood borne diseases in Pakistan
- Describe the routes of spread of blood borne diseases

HL-CM-003: Genetic diseases

- Genetic counseling of parents

Behavioral Sciences

HL-BhS- 001: Counseling,informational care

- Psychological counseling of patients and their families

L-BhS- 002: 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

Biochemistry/Dermatology

HL-Ag-001: Platelet Rich Plasma Therapy

- Discuss the role of platelets in PRP treatment in old age (for skin, hairs and joints)

HL-Ag-002: Glutathione

- Explain the role of glutathione in skin whitening

H&L MODULE CSF:

DEPTT OF SURGERY:

- Detail the steps of drawing blood from a vein

DEPTT OF MEDICINE:

- Check for pallor in the conjunctiva, tongue and palm of hands

PERLS BLOCK-1:

PERLs-1-01

- Describe a portfolio
- Describe types of portfolios

- Identify portfolio entries
- Write reflection based on Gibbs reflective cycle

PERLs-1-02

- Demonstrate non-verbal and verbal communication skills
- Describe principles of communication
- Discuss types of communication at professional level
- Identify different communication styles
- Explain the importance of non-verbal communication
- Demonstrate active listening
- Describe assertive communication techniques
- Describe barriers to effective communication

PERLs-1-03

- Follow the dress code and rules and regulations of the institution
- Demonstrate punctuality

PERLs-1-04

- Describe characteristics of a team
- Describe types of team
- Discuss stages of team development
- Identify various team roles
- Discuss barriers to effective team work

PERLs-1-05

- Maintain personal privacy while sharing information
- Identify cyber bullying, harassing, and sexting
- Describe cyber security laws
- Discuss digital rights and responsibilities

PERLs-1-06

- Discuss science and scientific evidence

PERLs-1-07

- Identify gaps in learning through reflection

TOPICS REQUIRING INTEGRATION:

1. TOPICS REQUIRING INTEGRATION WITH RADIOLOGY

ANATOMY

F-A-009

- Identify displacement of fracture segments of the bone
- Identify dislocation of joints

2. TOPICS REQUIRING INTEGRATION WITH MEDICINE

PHYSIOLOGY

HL-P-006

- Define thrombocytopenia
- Enlist the causes and consequences of thrombocytopenia

BIOCHEMISTRY

HL-B-003

- Explain the iron metabolism with mechanism of absorption and factors affecting it.
- Interpret iron deficiency anemia on basis of given data and microscopic findings
- Interpret folic acid and cobalamin in relation to anemias on given data and microscopic findings
- Discuss biochemical role of pyridoxine and vitamin C in microcytic anemia

3. TOPICS REQUIRING INTEGRATION WITH GYNAECOLOGY

ANATOMY

F-A-012

- Describe the prenatal and postnatal maturation of oocyte

F-A-015

- Describe the hormonal control of female reproductive cycles
- Enumerate and describe the steps of the ovariancycle
- 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

F-A-019

- 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

F-A-020

- Compare and contrast the villi.

F-A-023

- Describe the formation and 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.
- Describe the molecular factors responsible for gastrulation.

F-A-028

- Describe the cephalo-caudal folding
- Describe the lateral folding

F-A-029

Enlist and describe the derivatives of ectoderm

F-A-033

- Tabulate the criteria for estimating fertilization age during the fetal period
- Describe the procedures for assessing fetal status
- Describe the clinical picture of IUGR and factors resulting in IUGR
- Define pre-eclampsia

F-A-034

- List the fetal membranes
- Describe the macroscopic and microscopic features of decidua
- Enlist the various parts of decidua
- Functionally correlate the parts of the decidua with its structure
- Describe the changes in the trophoblast leading to the development of placenta
- Describe the structure (macroscopic and microscopic) of placenta
- Enlist and correlate the functions of placenta with its structure
- Describe the microscopic anatomy of Placental membrane
- Describe the placental circulation (fetal and maternal) embryologically justify the hemolytic disease of the neonate (Erythroblastosis fetalis)
- Describe the functions of placenta

F-A-035

- Describe the formation and 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

4. TOPICS REQUIRING INTEGRATION WITH PEDIATRICS

ANATOMY

F-A-026

- 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

F-A-029

- Enlist and describe the derivatives of ectoderm

PHYSIOLOGY

HL-P-009

- 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, urticaria and Hay fever.

5. TOPICS REQUIRING INTEGRATION WITH CARDIOLOGY

ANATOMY

F-A-027

- Describe the processes of vasculogenesis and angiogenesis
- Explain the features of primordial cardiovascular system
- Describe the anatomical justification for capillary hemangiomas

6. TOPICS REQUIRING INTEGRATION WITH NEPHROLOGY

PHYSIOLOGY

HL-P-012

- Explain the process of tissue typing
- Explain the prevention of graft rejection by suppressing immune system

7. TOPICS REQUIRING INTEGRATION WITH DERMATOLOGY

BIOCHEMISTRY

HL-Ag-01

- Discuss the role of platelets in Platelet-Rich Plasma (PRP) treatment in old age (for skin, hairs and joints)
- Explain the role of glutathione in skin whitening

8. TOPICS REQUIRING INTEGRATION WITH BIOCHEMISTRY

ANATOMY

F-A-044

- Describe the electron microscopic structure and functions of the following apical cell surface specializations:
    - Microvilli
    - Stereocilia
    - Cilia

F-A-045

- 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.

9. TOPICS REQUIRING INTEGRATION WITH GERIATRICS

BIOCHEMISTRY/AGING

F-Ag-001

- Discuss telomeres and telomerase and their clinical significance in aging.

10.TOPICS REQUIRING INTEGRATION WITH PHYSIOLOGY

ANATOMY

F-A-018

- Define contraception
- Explain the mechanisms of following contraceptive techniques:

- Barrier methods
- Hormonal methods
- Intrauterine device (IUD)
- Emergency contraceptive pills (ECPs)
- Male and female sterilization

F-A-042

Describe the structure of nuclear envelope and nuclear pores

F-A-045

- 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 and functions of mast cells.
- Role of mast cells in immediate hypersensitivity reactions.
- Describe structure of plasma cells and their role in antibody formation.

11.TOPICS REQUIRING INTEGRATION WITH PATHOLOGY

ANATOMY

F-A-041

- Explain different modes of transport across the cell membrane

F-A-042

- List the membranous and non-membranous cellular organelles
- Describe the structure of the following cellular organelles and correlate with their function:
  - Ribosomes
  - 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

F-A-043

- Describe structure of different types of cell junctions
- Describe the cell cycle and cell division
- Define important clinic-pathological terms:
  Atresia, Hypertrophy, Atrophy, Hyperplasia, Metaplasia, Anaplasia, Neoplasia, Inflammation, Metastasis

F-A-044

- Classify and exemplify the epithelia with their histological structure, locations and functions

F-A-045

- Describe lipid storage and mobilization in and from adipocytes and compare the brown and white adipose tissue

PHYSIOLOGY

HL-P-011

- Discuss the features and complications of mismatched blood transfusion reaction
- Describe the hazards of blood transfusion
- Elaborate the transplantation of tissues and organs

BIOCHEMISTRY

HL-B-002

- Discuss hemoglobinopathies 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:
    - Hypochromic microcytic
    - Normochromic microcytic
    - Normochromic normocytic
    - Macrocytic (megaloblastic)

12. TOPICS REQUIRING INTEGRATION WITH ANATOMY

PHYSIOLOGY

F-P-007

- Discuss components of ANS (autonomic nervous system)
- Explain the physiological anatomy of sympathetic and parasympathetic nervous system
- Describe the types of adrenergic and cholinergic receptors and their functions
- Explain the effects of sympathetic and parasympathetic on various organs/ system of body

X. TEACHING AND LEARNING METHODOLOGIES (INSTRUCTIONAL STRATEGIES)

- Large Group Interactive Session (LGIS)
- Team based learning (TBL)
- Problem based learning (PBL) and Case based learning (CBL)
- Tutorials
- Reflective Writing
- Bedside Teaching
- Simulation
- Skill laboratories
- Clinical Case based Conference
- Laboratory Practical
- Ward Rounds
- Demonstrations
- Case Presentations

XI. LEARNING RESOURCES

Books, handouts, and log books:

Books:

Anatomy

- Langman's Medical Embryology
- Snell's Clinical Anatomy
- Snell's Clinical Neuroanatomy
- Laiq H.S Medical Histology
- Laiq H.S General Anatomy

Physiology

- Guyton AC and Hall JE. Textbook of Medical Physiology
- Essentials of Medical Physiology by Mushtaq Ahmad

Biochemistry

- Harper's Biochemistry
- Lippincott's Illustrated Reviews Biochemistry
- ABC of clinical genetics by H.M. Kingston

Pathology

- Vinay Kumar, Abul K. Abbas and Nelson Fausto. Robbins and Cotran, Pathologic basis of disease.
- Richard Mitchell, Vinay Kumar, Abul K. Abbas and Nelson Fausto. Robbins and Cotran, Pocket companion to Pathologic basis of disease
- Walter and Israel General Pathology

Pharmacology

- Basic and clinical Pharmacology by Katzung
- Pharmacology by Champe and Harvey, Lippincott

Behavioral Sciences

- Handbook of Behavioral Sciences by Prof. Mowadat
- Medical and Psychosocial Aspects of Chronic Illness and Disability

Community Medicine

- Parks Textbook of Preventive and Social Medicine
- Public Health and Community Medicine Ilyas

Surgery

- Bailey & Love' Short practice of Surgery

Medicine

- Davidson's Principles and Practice of Medicine

Islamiyat

- Standard Islamiyat (compulsory) for MBBS by Prof. M. Sharif Islahi
- Ilmi Islamiyat (compulsory) for BA, BSc & equivalent

XII: ASSESSMENT (TOOLS, POLICY, SCHEDULE, TOS)

- **Tools for formative and summative assessments:**
  - Written examination: MCQs and SEQs
  - Oral/Practical/Clinical: OSPE, OSCE, Structured Viva
- **Assessment policy:**
  - **Eligibility criteria for appearing in UHS annual examination:**
    a. Minimum 85% attendance (in each block and in the aggregate)
    b. Minimum 50% aggregate marks (i.e.,450/900)
  - **Retake of institutional block examination/s will be allowed only under special circumstances.**
  - Candidates falling short of attendance requirement shall not be admitted to the annual examination but may be permitted to appear at the supplementary examination if they make up the deficiency up to the commencement of next examination by remaining on rolls of a college as regular student, subject to fulfillment of all other mandatory requirements to appear at the examination.
  - College may arrange remedial classes and one re-sit for each block examination, either with the subsequent block examination or before completion of the subsequent block, and before or during preparatory leave in case of terminal block of the professional year, before issuance of date sheet for the concerned professional examination.
    a. The students can appear in re-sit of a block examination, along with the subsequent block, and before or during preparatory leave for the terminal block of the professional year, once the requirement of attendance is met with. However, conduct of remedial classes shall be permitted only in the cases of students, who shall have attended at least 50% of the total attendance of the concerned block in the first instance.
    b. The valid reasons for short attendance in block or absence from a block examination may include major illness/accident/surgery of the student or death of an immediate relative/being afflicted by a natural calamity or disaster.

- **Assessments schedule:**
  - Formative assessments

    A total of six combined tests were conducted in block-1 including the content covered by all departments according to the TOS extracted from TOS of block-1 paper. The tests were jointly organized by three basic departments and led by Biochemistry dept. The invigilation was such that no two students sitting side by side had MCQ paper at the same time (MCQs were handed over in two rounds).

Foundation -1

Test-1 04-03-24

Test-2 18-03-24

Test-3 01-04-24

Test-4 17-04-24

H&L-1

Test-1 06-05-24

Test-2 17-05-24

TOS for Tests:1-4

S. No	Subjects	UHS GUIDELINES FOR BLOCK-1		PROPOSED TOS FOR TEST-1-4	
		MCQs (85)	SEQs (7)	MCQs (40)	SEQs (4)
1	Anatomy	20 (23.52%)	03	10 (25%)	**2**
2	Physiology	22 (25.88%)	02	10 (25%)	**1**
3	Biochemistry	22 (25.88%)	02	10 (25%)	**1**
4	Comm. Med & Public Health	5 (5.88%)	-	2 (5%)	-
5	Behavioral sciences	5 (5.88%)	-	2 (5%)	-
6	Pathology	6 (7.0%)	-	3 (7.5%	-
7	Pharmacology	5 (5.88%)	-	3 (7.5%)	-

TOS for Tests:5 & 6

S. No	Subjects	PROPOSED TOS FOR TEST-5 & 6	
		MCQs (40)	SEQs (4)
1.	Physiology	15	**2**
2.	Biochemistry	15	**2**
3.	Comm. Med & Public Health	2	-
4.	Behavioral sciences	2	-
5.	Pathology	3	-
6.	Pharmacology	3	-

- **Block-1 examination schedule:**

  a. Written examination

  27-05-24 (MCQs & SEQs in a ratio of 70:30 %)

  b. Oral & practical examination

  29-05-24, 30-05-24, 31-05-24

- **TOS for block-1 examination:**

THEME	SUBJECT	WRITTEN EXAM			ORAL/PRACTICAL/CLINICAL EXAM			
		MCQs (1 Mark)	SEQs	Marks	OSPE	OSCE	OSVE	Marks

			(5 Marks each)		(8 Marks each) Observed	(8 Marks each) Observed	(16 Marks each)	
Normal structure	**Anatomy & applied/clinical**	**20**	**3**	**35**	**3**	**-**	**1**	**40**
Normal Function	**Physiology & applied/clinical**	**22**	**2**	**32**	**2**	**-**	**1**	**32**
	Biochemistry & applied/clinical	**22**	**2**	**32**	**2**	**-**	**1**	**32**
Disease Burden & Prevention	**Community Medicine & Public Health**	**5**	**-**	**5**	**-**	**-**	**-**	**-**
	Behavioral Sciences	**5**	**-**	**5**	**-**	**-**	**-**	**-**
Pathophysiology & Pharmacotherapeutics	**Pathology**	**6**	**-**	**6**	**-**	**-**	**-**	**-**
	Pharmacology	**5**	**-**	**5**	**-**	**-**	**-**	**-**
CFRC	**CF- 1-2**	**-**	**-**	**-**	**-**	**1**	**-**	**8**
PERLs	**PERLs- 1-2**	**-**	**-**	**-**	**-**	**1**	**-**	**8**
Total		**85**	**7x5=35**	**120**	**7 stations x 8=56**	**2 stations x 8=16**	**3 stations X 16=48**	**120**

	Theory		**Practical**			**Total**
Block 1 (Foundation-I + Hematopoietic & Lymphatic modules)	Part I MCQs (85) Part II SEQs (7)	85 Marks 35 Marks	Practical /Clinical Exam	07 OSPE 02 OSCE 03 OSVE	56 16 48	**300**
	Internal Assessment 10%	30 Marks	Internal Assessment 10%	30 Marks		
	Total	**150**	**Total**	**150**		

NOTE:

1. The continuous internal assessment through `Block Examination` conducted by the college of enrollment shall carry 60 marks, i.e., 20% of the total allocated marks for the block. The score shall be equally distributed to the Written and Oral/Practical/Clinical examination.
2. No grace marks should be allowed in any examination or practical under any guise or name.