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Pakistan Medical Commission

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NOTIFICATION

Approval of Syllabus and Structure of National Equivalence Board (NEB) Examination 2021 for Foreign Medical Students

The Council in its 9th meeting held on 2nd October, 2021 considered and approved the Syllabus and Structure of National Equivalence Board (NEB) Examination 2021 for Foreign Medical Students recommended by the National Medical and Dental Academic Board.

Secretary

Pakistan Medical Commission





Pakistan Medical Commission
National Equivalence Board (NEB)
Examinations 2021
for
Foreign Medical Students

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SECTION I: PREAMBLE

Pakistan Medical Commission (PMC) will be conducting the National Equivalence Board (NEB) for those Pakistani students who wish to migrate to a medical college in Pakistan. This examination is being held based on section 21 of the Pakistan Medical Commission Act No XXXIII of 2020.

As per section 13 (e) of the PMC Act, the National Medical and Dental Academic Board has developed the structure and standards of the National Equivalence Board (NEB) Examinations 2021.



SECTION II: FORMAT AND STRUCTURE OF NEB EXAMINATION 2021

Eligibility:

Any student who has completed more than two years of a medical programme in any medical institution or college outside Pakistan shall be eligible to register for and attempt the respective NEB Examination to seek a transfer/migration to a PMC recognized medical college in Pakistan in the relevant year having completed the period of a foreign programme up to the subsequent year in the institution seeking a transfer from. A student shall be required to take the NEB Examination within twelve months of having left the programme of study outside Pakistan to be eligible for admission to a medical or dental college in Pakistan.

Please note that transfer/migration from the medical institution or college outside Pakistan will only be allowed if there is a vacant seat available in the Pakistani Medical College where transfer/migration is being sought. The student intending to transfer/migrate will not be accommodated over and above the seats approved/allocated for that particular Pakistani Medical College.

For the Year 2021 only

In 2021 only, the NEB Examination is also being offered to those foreign students who are currently studying in foreign medical colleges listed in List C (please refer to PMC website) and wish to migrate to MBBS Year 2 in a Pakistani Medical or Dental College recognised by PMC. This is subject to:

- i. Having more than 65% marks in their FSs or HSSC.
- ii. Qualifying the requisite NEB Examination for the 2nd Year transfer from a foreign college.

Centres:

NEB Examinations 2021 will be conducted at multiple centres across Pakistan to facilitate the candidates. It is envisaged that NEB Examination will be offered certain international centres as well.

Frequency:

The NEB Examination will be held at least twice a year.

Number of attempts:

There shall be no restriction on the number of attempts by a student subject to taking the NEB Examination for the first time within twelve months of having left their program of study in the foreign institution. A person may re-attempt the exam at any future scheduled NEB Examination window notified by PMC.

Validity

A student's NEB Examination result shall be valid for two years from the date of the examination. If a student retakes the NEB Examination during this period, the person may use the highest attained result to apply for transfer to a medical or dental college in Pakistan.

Result

The results of the NEB Examination as communicated and issued shall be final and shall be neither available for rechecking or any other objection from the student who has taken the examination

Structure

The theory component of the NEB Examination shall be substantially based on computer-based multiple-choice questions (MCQs). The MCQs will target higher cognition and will check a candidate's ability to apply knowledge. The theory component will have 200 MCQs in which there will be an emphasis on the application of knowledge. The duration of the theory component of the NEB Examination will be three hours.

For transfer in MBBS Year 3: candidates will be required to appear in the theory component of the NEB Examination only.

For transfer in MBBS Year 4: candidates will be required to appear in the theory component of the NEB Examination only.

For transfer in MBBS Year 5: 70% or above in both the theory and clinical skills component of NEB Examination.

There will be no negative marking in both components of the NEB Examination.

NEB Examination – Basic (for Year 2021 only)

Eligibility: Student must have passed MBBS Year 1 from a Medical College in List C (please refer to PMC website) and intends to migrate to MBBS Year 2 of a Medical College in Pakistan recognised by PMC. Please also refer to eligibility criteria above. **This NEB Examination –**

Basic will be offered in 2021 only.

Disciplines: Anatomy, Biochemistry, Physiology (see syllabus below)

MCQ's Weightage: Anatomy 45%, Physiology 35%, Biochemistry 20%

NEB Examination (Medical) Standard 3 (for transfer to MBBS Year 3)

Eligibility: Student must have passed MBBS Year 2 from a PMC recognised foreign Medical College and intends to migrate to MBBS Year 3 in a PMC recognised Medical College in Pakistan.

Disciplines: Anatomy, Biochemistry, Physiology (see syllabus below)

MCQ's Weightage: Anatomy 45%, Physiology 35%, Biochemistry 20%

NEB Examination (Medical) Standard 4 (for transfer to MBBS Year 4)

Eligibility: Student must have passed MBBS Year 3 from a PMC recognised foreign Medical College and intends to migrate to MBBS Year 4 in a PMC recognised Medical College in Pakistan.

Disciplines: General Pathology, General Microbiology and Pharmacology

MCQ's Weightage: General Pathology 25%, General Microbiology 25%, Pharmacology 50%

NEB Examination (Medical) Standard 5 (for transfer to MBBS Year 5)

Eligibility: The student must have passed MBBS Year 4 from a PMC recognised foreign Medical College and intends to migrate to MBBS Year 5 in a PMC recognised Medical College in Pakistan.

Disciplines: Special Pathology, Community Medicine, Ophthalmology and ENT

MCQ's Weightage: Special Pathology 20%, Community Medicine 10%, Ophthalmology 35%, ENT 35%

Passing criteria

For transfer in MBBS Year 3: 70% or above in theory component of NEB Examination.

For transfer in MBBS Year 4: 70% or above in theory component of NEB Examination.

For transfer in MBBS Year 5: 70% or above separately in both the theory and clinical skills component of NEB Examination. Candidates will have to pass both the theory and the clinical skills component separately to be declared successful in NEB Examination.

Candidates who pass the theory (MCQs) component but fail the clinical Skills component will have to re-appear in the clinical skills component only. Such candidates will re-register for the clinical skills component only.

If a candidate fails in three consecutive attempts of the clinical skills component, she/he will have to appear in both the theory (MCQs) and clinical skills component on the fourth attempt. That is, after every three failed attempts at the clinical skills component, candidates will have to sit the entire NEB Examination.

Limitations

Please note that a foreign student will not be allowed to migrate in a particular MBBS year of a Medical College in Pakistan if more than two months have passed since the start of the academic year. In cases where over two months have passed since the start of the academic year, the foreign student will be allowed migration in the preceding year.

Successfully clearing NEB Examination does not guarantee admission to a Pakistani Medical College as it will depend on the availability of seats in the admitting medical college and its admissions policy.

ANNEXURE I

Syllabus for NEB Examination – Basic (for the Year 2021 only)

ANATOMY

Introduction to:

- Radiological, clinical and applied anatomy
- Terms and planes of Gross anatomy
- Developmental anatomy/embryology
- Anatomical positions

Overview of the Skeletal system:

- Axial and appendicular skeleton
- Definition and Classification of bones
- Functions of bones
- Parts of a young and adult bone
- Ossification of bones
- Blood supply of bones
- Characteristics and classification of joints
- Characteristics features of a synovial joint
- Classification of synovial joints
- Movements at different joints

Introduction to the Muscular system:

- Classification of muscles
- Structure of skeletal muscles
- Parts of a typical skeletal muscle
- Aponeurosis, tendons, bursae, ligaments and sheaths
- Blood supply and nerve supply of muscles

Introduction to the Nervous system

- Classification of the nervous system

GENERAL HISTOLOGY

- Different types of microscopes
- Parts of a light microscope
- Structure of an animal cell

- Different organelles and surface projections of a cell
- Basic tissues
- Epithelium, its classification with examples
- Muscle tissue, its classification with examples
- Connective tissue, and structure of various general connective tissues
- Nervous tissue
- Applied anatomy

GENERAL EMBRYOLOGY AND ASPECTS OF GENETICS

- Cell division and structure of DNA
- Principles of cytogenetics
- Structure of genes and relation to DNA
- Terms used in embryology
- Gametogenesis
- Fertilization, cleavage and implantation of an embryo
- Molecular mechanisms involved in embryology
- Development in 2nd and 3rd week of intrauterine life
- Changes in the embryo between 4th to 8th week
- Derivatives of germinal layers
- Overview of organogenesis from 3-9th month
- Twinning and teratology

Applied Embryology

- Genetic disorders
- Infertility
- Ectopic pregnancy
- Twinning
- Placental abnormalities
- Abortion
- Anomalies of organogenesis and foetal period
- Artificial insemination
- IVF
- Common genetic malformations

REGIONAL/SYSTEMIC ANATOMY

Limbs: Upper limbs

- Surface anatomy
- Bones and joints
- Joint movements and related muscles
- Muscle compartments

- Muscles, aponeuroses, sheaths, ligaments, retinacula
- Blood supply
- Lymphatic drainage
- Nerve supply (sensory and motor) and nerve plexuses
- Histological features of skeletal muscles
- The microscopic structure of tendon, ligament and loose areolar tissue, and osseous tissue
- Histological structure of various types of cartilages

Applied anatomy

- Fractures of the clavicle and other long bones
- Colle's fracture
- Frozen shoulder
- Rheumatoid arthritis and osteoarthritis
- Dislocation of shoulder joint
- Brachial plexus injuries

Lower limbs

- Surface anatomy
- Bones and joints
- Joint movements and related muscles
- Muscle compartments
- Muscles, aponeuroses, sheaths, ligaments, retinacula
- Blood supply
- Lymphatic drainage
- Nerve supply (sensory and motor) and nerve plexuses

Applied anatomy

- Inguinal and femoral hernias
- Varicose veins
- Fracture of lower limb
- Bones and dislocations of joints
- Motor and sensory loss
- Paralysis of muscles
- Sprain
- Atrophy
- Dystrophy and muscle spasms
- Common fractures
- Osteomyelitis and osteoporosis
- Dislocation
- Subluxation

- Frozen joints
- Arthritis and injuries.

Development of the Musculoskeletal system

- Development of axial and appendicular skeleton
- Development of skeletal, smooth and cardiac muscles

Applied anatomy

- Common developmental anomalies of muscles and bones
- Genes, transcription factors, growth factors and signalling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Thorax

- Surface anatomy
- Ribs, thoracic vertebrae, sternum and their joints
- Muscles of thoracic cage and extrathoracic muscles attached to the thorax
- Mechanism of respiration in above-mentioned wall muscles and diaphragm
- Blood supply
- Lymphatic drainage
- Mediastinum
- Thoraco-abdominal diaphragm
- Nerve supply (sensory and motor)

Applied anatomy

- Fractures of ribs and vertebrae
- Paralysis of diaphragm and intercostal muscles
- Pleurisy
- Hydrothorax
- Pneumothorax
- ischaemic heart disease myocardial infarction
- atrial and ventricular conduction defects.

Respiratory system (gross and microscopic anatomy)

- Nasal and respiratory mucosa
- Larynx (vocal folds)
- Pharynx
- Trachea
- Bronchi

- Lungs and pleural cavities
- Development of upper (nose, pharynx, larynx and trachea) and lower (lungs and bronchi) respiratory organs.

Applied anatomy

- Developmental abnormalities of nasal passage, trachea and lungs
- Genes, transcription factors, growth factors and signalling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Cardiovascular system (gross and microscopic anatomy)

- Pulmonary and systemic blood circulatory systems
- Arterial, venous and Portal blood circulatory systems
- Histological features of cardiac muscles, arterial and venous blood vessels
- Heart and Pericardium

Applied anatomy

- Atherosclerosis
- varicose veins
- aneurysms
- angiography
- anastomoses
- Development of heart and pericardium
- major veins and arteries
- Development of the foetal circulation and its changes at birth.
- Congenital anomalies of heart and vessels
- Genes, transcription factors, growth factors and signalling molecules
- involved in the development of all above-mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

PHYSIOLOGY

Cell and General Physiology

- Functional organization of the human body
- Homeostasis
- Control systems in the body
- Cell membrane and its functions
- Intercellular Connections
- Cell organelles
- Transport through the cell membrane
- Membrane transport including active transport, passive transport, simple and facilitated diffusion
- Types of particles in solution
- Importance of selectively permeable membranes, osmosis and osmotic pressure, surface tension, viscosity also in relation to body fluids
- Facilitated diffusion

Clinical/Applied Concepts

- Failure of homeostasis (Illness)
- Abnormalities of the cell and its organelles (apoptosis, mutation, cancer and aging)

Blood

- Composition and functions
- Plasma proteins: albumin, globulin fibrinogen, and their functions
- Red blood cells (Erythropoiesis)
- Haemoglobin and blood indices, iron metabolism, fate of haemoglobin.
- White blood cells, Leucopoiesis, functions
- Platelets
- Haemostasis, clotting factors, anticoagulants
- Blood groups, Blood transfusion and complications
- Reticuloendothelial system – Spleen

Clinical/Applied Concepts

- Anaemia and its types
- Blood indices in various disorders Thalassemia
- Leucopaenia Leucocytosis, leukaemia, AIDS, allergy, vaccination
- Thrombocytopenia
- Clotting disorders (haemophilia etc.)
- Blood grouping/cross matching and significance

Nerve and muscle

- The neuron-structure and functions
- Properties of nerve fibres
- Physiology of action potential including compound action potentials
- Conduction of nerve impulse, nerve degeneration and regeneration
- Synapses
- Types of muscle, functions
- Skeletal muscle contraction
- Isometric and isotonic contraction
- Smooth muscle contraction
- Neuromuscular junction
- Excitation-contraction coupling
- Motor unit
- Neuromuscular junction blockers

Clinical/Applied Concepts

- Nerve conduction studies
- Electromyograms (EMG)
- Nerve injury
- Rigor mortis and contractures
- Myasthenia gravis
- Myopathies/Neuropathies

Cardiovascular system

- Introduction to heart and circulation
- Properties of cardiac muscle
- Action potential in atrial and ventricular muscle and pace-maker potential
- Artificial pacemaker
- Cardiac impulse- origin and propagation
- Cardiac cycle Regulation of cardiac functions
- ECG-recording and interpretation
- Arrhythmias- mechanism of development
- Functional types of blood vessels
- Haemodynamics of blood flow
- Local control of blood flow
- Systemic circulation - basic principles/characteristics and control
- Cardiac output (regulation/measurement) peripheral resistance and its regulation
- Arterial pulse
- Arterial blood pressure (short/long term regulation)
- Heart sounds/murmurs

- Venous return and its regulation
- Coronary circulation
- Splanchnic circulation
- Cerebral circulation
- Cutaneous circulation- Triple response
- Foetal circulation and readjustments at birth
- Cardiovascular changes during exercise

Clinical/Applied Concepts

- Correlation of cardiac cycle with Electrocardiogram (ECG) and heart sounds
Echocardiogram
- Significance of apex beat / abnormalities
- ECG interpretation in cardiac muscle abnormalities and cardiac arrhythmias
- Flutter, fibrillation, ectopic beats
- Conduction defects
- Radial/other pulses
- Hypertension, types and effects
- Clinical evaluation of heart sounds and murmurs
- Jugular venous pulse
- Ischemic heart disease
- Cerebrovascular accidents
- Types of heart failure and circulatory shock

Respiratory system

- Organization/functions of respiratory tract
- Functions of lungs (respiratory and non-respiratory)
- Mechanics of breathing, pulmonary pressure changes
- Surfactant and compliance
- Protective reflexes
- Lung volumes and capacities
- Dead spaces
- Diffusion of gases (gas laws, composition)
- Pulmonary Circulation Ventilation / perfusion
- Transport of O₂ in blood O₂/CO₂ disassociation curves
- Transport of CO₂ in blood
- Regulation of respiration (nervous/chemical)
- Abnormal breathing
- Hypoxia-types and effects
- Physiology of cyanosis
- Physiology of high altitude, space, deep sea diving
- Oxygen debt

- Respiratory changes during exercise

Clinical/Applied Concepts

- Examination of chest
- Types of respiration (intrapleural pressure, pneumothorax, effusion)
- Atelectasis
- Lung function tests (Spirometry)
- Sneezing, yawning, cough
- Obstructive / Restrictive lung disease (FEV1/FVC)
- Abnormal Ventilation / Perfusion
- Respiratory failure: Types I & II
- Asphyxia
- Hypoxia, cyanosis, dyspnoea, hypo- and hypercapnoea
- Artificial respiration
- Oxygen therapy and its toxicity
- Caisson's disease



BIOCHEMISTRY

Cell Biochemistry

- Introduction to biochemistry
- Biochemical composition and functions of the cell
- Biochemistry of eukaryotes, prokaryotes and archaea
- Cell membranes and their chemical composition
- Importance of lipids and proteins in cell membranes
- Signalling pathways and receptors
- Methods to study cell biochemistry (microscopy, centrifugation, spectrophotometry, chromatography, electrophoresis and thermal cycler)

Body fluids and pH regulation

- Ionization of water, weak acids and bases
- pH and pH scale
- pK values, dissociation constant and titration curve of weak acids
- Body buffers and their mechanism of action
- Henderson – Hasselbach's equation
- Acid base regulation in human body
- Biochemical mechanisms for control of water and electrolyte balance.

Carbohydrates

- Definition, biochemical function and classification
- Structure and functions of monosaccharides and their derivatives
- Disaccharides and their important examples
- Oligosaccharides and their combination with other macromolecules
- Polysaccharides and their important examples and biochemical role
- Biochemical importance of carbohydrates

Proteins

- Definitions, biochemical importance and classification of proteins based on physiochemical properties
- Amino acids and their structure, properties and functions
- Classification and nutritional significance of amino acids
- Dissociation, titration and importance of amino acids
- Structure of proteins and their significance in pH maintenance
- Separation of proteins e.g. salting out, electrophoresis, chromatography, centrifugation
- Immunoglobulins and their biomedical significance
- Plasma proteins and their clinical significance

Nucleotides and Nucleic Acids

- Chemistry of purines and pyrimidines, their types, structure and function
- Chemistry and structure of nucleoside and nucleotide and their biochemical role
- Derivatives of purines and pyrimidines, their role in health and disease
- Nucleic acids, their types, structure and functions (gout)

Lipids and Fatty Acids

- Classification of lipids and their biochemical functions
- Structure and biochemical function of phospholipids, glycolipids and sphingolipids
- Classification of fatty acids and their biochemical functions
- Functions of essential fatty acids
- Identification of fats and oils (saponification, acid number)
- Eicosanoides and their function in health and disease (overview)
- Steroids and their biochemical role
- Cholesterol, its structure, chemistry and functions
- Lipid peroxidation and its significance

Enzymes

- Classification/nomenclature
- Properties of enzymes and catalysts
- Functions of enzymes and catalysts
- Co-enzymes and co-factors
- Isozymes and their clinical importance
- Factors affecting enzyme activity (Michaelis – Menten and Lineweaver Burk equations)
- Classification of enzyme inhibitors and their biochemical importance
- Therapeutic use and application of enzymes in clinical diagnosis

Porphyryns and Haemoglobin

- Chemistry and biosynthesis of porphyryns and related disorders
- Structures, functions and types of haemoglobin
- Oxygen binding capacity of haemoglobin, factors affecting and regulating the oxygen binding capacity of haemoglobin
- Degradation of haeme, formation of bile pigments, its types, transport and excretion
- Hyperbilirubinemia, biochemical causes and differentiation
- Haemoglobinopathies (Hb-S, Thalassemia etc.) and their biochemical causes

ANNEXURE II

Syllabus for NEB Examination (Medical) Standard 3 (for transfer to MBBS Year 3)

ANATOMY

Introduction to:

- History and disciplines of Anatomy
- Radiological, clinical and applied anatomy
- Terms and planes of Gross anatomy
- Developmental anatomy / embryology
- Anatomical positions

Overview of the Skeletal system

- Axial and appendicular skeleton
- Definition and Classification of bones
- Functions of bones
- Parts of a young and adult bone
- Ossification of bones
- Blood supply of bones
- Characteristics and classification of joints
- Characteristics features of a synovial joint
- Classification of synovial joints
- Movements at different joints

Introduction to the Muscular system

- Classification of muscles
- Structure of skeletal muscles
- Parts of a typical skeletal muscle
- Aponeurosis, tendons, bursae, ligaments and sheaths
- Blood supply and nerve supply of muscles

Introduction to the Nervous system

- Classification of nervous system

GENERAL HISTOLOGY

- Different types of microscopes
- Parts of a light microscope
- Structure of an animal cell

- Different organelles and surface projections of a cell
- Basic tissues
- Epithelium, its classification with examples
- Muscle tissue, its classification with examples
- Connective tissue, and structure of various general connective tissues
- Nervous tissue
- Applied anatomy
- Commonest clinical conditions related to each histological practical

GENERAL EMBRYOLOGY AND ASPECTS OF GENETICS

- Cell division and structure of DNA
- Principles of cytogenetics
- Structure of genes and relation to DNA
- Terms used in embryology
- Gametogenesis
- Fertilization, cleavage and implantation of embryo
- Molecular mechanisms involved in embryology
- Development in 2nd and 3rd week of intrauterine life
- Changes in embryo between 4th to 8th week
- Derivatives of germinal layers
- Overview of organogenesis from 3-9th month
- Twinning and teratology

Applied Embryology

- Genetic disorders
- Infertility
- Ectopic pregnancy
- Twinning, placental
- Abnormalities
- Abortion
- Anomalies of organogenesis and foetal period,
- Artificial insemination,
- IVF
- Common genetic malformations

REGIONAL/SYSTEMIC ANATOMY

Neuroanatomy

- Gross and surface anatomy of the skull and cervical vertebrae
- Parts of brain and spinal cord
- Limbic system

- Cranial nerve nuclei and peripheral distribution
- Ascending and descending tracts
- Spinal nerves
- Sensory, motor and autonomic nervous system
- Nerve lesions of cranial and somatic nerves
- Membranes or meninges of brain and spinal cord and dura venous sinuses
- Blood supply of nervous system and clinical manifestations related to blockage and rupture of blood vessels supplying the nervous system
- Cerebrospinal fluid (CSF) and ventricles
- Development of nervous system (normal and abnormal)
- Microscopic anatomy of CNS (nervous tissue, nerve, ganglion and different parts of brain spinal cord)
- Radiological anatomy (CT scan , MRI)
- Applied anatomy
- Meningitis, paralysis, peripheral nerve lesions

Development of the Nervous system

- Development of brain and spinal cord
- Development of peripheral and autonomic nerves
- Development of meninges and ventricles.

Applied anatomy

- Congenital anomalies of brain and spinal cord
- Genes, transcription factors, growth factors and signaling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Head and Neck

- Surface anatomy of head and neck
- Skull, cervical vertebrae and their joints
- Muscles and fasciae of scalp, face and neck with emphasis on organs of special senses (eye, ear, nose and tongue)
- Microscopic structure of cornea, sclera and retina
- Microscopic structure of internal ear (Cochlea)
- Emphasis must be given to applied histology related to clinical medicine and surgery
- Blood supply of head and neck (superficial and deep)
- Lymphatic drainage
- Oral cavity, pharynx, larynx, trachea and oesophagus, thyroid gland, triangles of neck
- Nerve supply (sensory and motor)
- Radiological anatomy

- Development of branchial apparatus including face, lips, nose, palate, tongue, skull and facial skeleton.

Applied Anatomy

- Cleft lip and palate
- Fontanelle
- Tracheo-esophageal fistula
- Thyroglossal cyst
- Genes, transcription factors, growth factors and signaling molecules
- involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors.
- peripheral nerve lesions of head and neck

Limbs: Upper limbs

- Surface anatomy
- Bones and joints
- Joint movements and related muscles
- Muscle compartments
- Muscles, aponeuroses, sheaths, ligaments , retinacula
- Blood supply
- Lymphatic drainage
- Nerve supply (sensory and motor) and nerve plexuses
- Histological features of skeletal muscles
- Microscopic structure of tendon, ligament and loose areolar tissue, and osseous tissue
- Histological structure of various types of cartilages

Applied anatomy

- Fractures of clavicle and other long bones
- Colle's fracture
- Frozen shoulder
- Rheumatoid arthritis and osteoarthritis
- Dislocation of shoulder joint
- Brachial plexus injuries

Lower limbs

- Surface anatomy
- Bones and joints
- Joint movements and related muscles
- Muscle compartments
- Muscles, aponeuroses, sheaths, ligaments , retinacula

- Blood supply
- Lymphatic drainage
- Nerve supply (sensory and motor) and nerve plexuses

Applied anatomy

- Inguinal and femoral hernias
- varicose veins
- fracture of lower limb bones and dislocations of joints
- motor and sensory loss
- paralysis of muscles
- Sprain, atrophy
- dystrophy and muscle spasms
- Common fractures
- osteomyelitis and osteoporosis
- dislocation
- subluxation
- frozen joints
- arthritis and injuries.

Development of the Musculoskeletal system

- Development of axial and appendicular skeleton
- Development of skeletal, smooth and cardiac muscles

Applied anatomy

- Common developmental anomalies of muscles and bones
- Genes, transcription factors, growth factors and signaling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Thorax

- Surface anatomy
- Ribs, thoracic vertebrae, sternum and their joints
- Muscles of thoracic cage and extrathoracic muscles attached to thorax
- Mechanism of respiration in context to chest wall muscles and diaphragm
- Blood supply
- Lymphatic drainage
- Mediastinum
- Thoraco-abdominal diaphragm
- Nerve supply (sensory and motor)

Applied anatomy

- Fractures of ribs and vertebrae
- Paralysis of diaphragm and intercostal muscles
- Pleurisy
- Hydrothorax
- Pneumothorax
- ischaemic heart disease
- myocardial infarction
- atrial and ventricular conduction defects.

Respiratory system (gross and microscopic anatomy)

- Nasal and respiratory mucosa
- Larynx (vocal folds)
- Pharynx
- Trachea
- Bronchi
- Lungs and pleural cavities
- Development of upper (nose, pharynx, larynx and trachea) and lower (lungs and bronchi) respiratory organs.

Applied anatomy

- Developmental abnormalities of nasal passage, trachea and lungs
- Genes, transcription factors, growth factors and signaling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Cardiovascular system (gross and microscopic anatomy)

- Pulmonary and systemic blood circulatory systems
- Arterial, venous and Portal blood circulatory systems
- Histological features of cardiac muscles, arterial and venous blood vessels
- Heart and Pericardium

Applied anatomy

- Atherosclerosis
- Varicose veins
- Aneurysms
- Angiography, anastomoses
- Development of heart and pericardium
- Major veins and arteries.

- Development of the foetal circulation and its changes at birth.

Applied anatomy

- Congenital anomalies of heart and vessels
- Genes, transcription factors, growth factors and signaling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Abdomen

- Digestive Systems (gross and microscopic anatomy)
- Surface anatomy of the abdomen
- Lumbar vertebrae
- Abdominal Wall: Anterolateral and posterior abdominal wall
- Abdominal and pelvic peritoneum
- Oral mucosa
- Gums
- Tongue
- Hard and soft palate
- Teeth
- Lips and oropharynx
- Salivary glands
- Abdominal viscera - oesophagus, stomach, duodenum, jejunum, ileum, colon, vermiform appendix, rectum, anal canal, liver and gall bladder, pancreas
- Blood supply of abdominal wall and viscera
- Lymphatic drainage of all abdominal
- Sensory, motor and autonomic nerve supply of abdomen
- Posterior abdominal wall and related structures
- Histological features of smooth muscles
- Radiological anatomy (with ultrasound U/S, computerized tomography CT scan, Barium studies)

Development of the Digestive System

- Development of diaphragm, body cavities and mesenteries
- Development of oesophagus, stomach, small and large intestines and anal canal
- Development of liver, pancreas and gall bladder
- Development of spleen

Applied anatomy

- Developmental defects of diaphragm
- Developmental defects of esophagus, intestines and other abdominal viscera

- Genes, transcription factors, growth factors and signalling molecules
- involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors.

Pelvis and Perineum

- Surface anatomy
- Bony pelvis (male and female)
- Muscles and fascia of pelvis and perineum
- Pelvic viscera
- Perineal regions and fossae

Applied Anatomy

- Rectal Prolapse
- Uterine prolapse
- Abscesses

Urinary system (gross and microscopic anatomy)

- Kidney
- Ureter
- Urinary bladder and urethra
- Development of the Urinary system: kidneys, urinary bladder and urethra

Applied anatomy

- Developmental abnormalities of kidneys, urinary bladder and urethra
- Genes, transcription factors, growth factors and signalling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Reproductive System:

Male (gross and microscopic anatomy)

- Scrotum
- Testes
- Genital ducts
- Seminal vesicles, prostate and bulbourethral glands, penis
- Development of the Male reproductive system: testes and genital ducts

Applied anatomy

- Undescended testicles
- Anomalies of testes and genital ducts
- Anomalies of external genitalia
- Genes, transcription factors, growth factors and signalling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Female (gross and microscopic anatomy)

- Ovaries
- Uterus and fallopian tubes
- Vagina
- Mammary gland
- Foetal membranes
- Placenta, umbilical cord and their anomalies

Development of the Female Reproductive System

- Development of ovaries
- Development of uterus and fallopian tubes
- Development of vagina
- Development of external genitalia

Applied anatomy

- Congenital anomalies of uterus, vagina
- Anomalies of external genitalia
- Undescended ovaries
- Genes, transcription factors, growth factors and signalling molecules involved in the development of all above mentioned organs and congenital anomalies related to mutations in genes and abnormal expression of the genetic factors

Endocrine system (gross and microscopic anatomy)

- Pituitary gland
- Thyroid and parathyroid glands
- Suprarenal glands
- Endocrine part of pancreas
- Enteroendocrine system
- Development of organs/ tissue of endocrine system

Immune system (gross and microscopic anatomy)

- Organization and components of lymphatic system
- Features of lymphatic vessels, Lymph node, Tonsils, Thymus, Spleen, GALT and MALT
- Development of lymphatic vessels, Lymph node, Tonsils, Thymus and Spleen

Applied anatomy

- Oedema, ascites
- lymphangitis
- lymphadenopathy

Integumentary system

- Structure and types of skin, nails and hair.
- Histological structure of thin and thick skin
- Receptors, cutaneous blood and nerve supply
- Superficial and deep fasciae

Applied anatomy

- Acute and chronic skin diseases
- congenital disorders of integument

PHYSIOLOGY

Cell and General Physiology

- Functional organization of human body
- Homeostasis
- Control systems in the body
- Cell membrane and its functions
- Intercellular Connections
- Cell organelles
- Transport through cell membrane
- Membrane transport including active transport, passive transport, simple and facilitated diffusion
- Types of particles in solution
- Importance of selectively permeable membranes, osmosis and osmotic pressure, surface tension, viscosity also in relation to body fluids
- Facilitated diffusion

Clinical/Applied Concepts

- Failure of homeostasis (Illness)
- Abnormalities of the cell and its organelles (apoptosis, mutation, cancer and aging)

Blood

- Composition and functions
- Plasma proteins: albumin, globulin fibrinogen, and their functions
- Red blood cells (Erythropoiesis)
- Haemoglobin and blood indices, iron metabolism, fate of haemoglobin.
- White blood cells, Leucopoiesis, functions
- Platelets
- Haemostasis, clotting factors, anticoagulants
- Blood groups, Blood transfusion and complications
- Reticuloendothelial system – Spleen

Clinical/Applied Concepts

- Anaemia and its types
- Blood indices in various disorders Thalassemia
- Leucopaenia Leucocytosis, leukaemia, AIDS, allergy, vaccination
- Thrombocytopenia
- Clotting disorders (haemophilia etc.)
- Blood grouping/cross matching and significance

Nerve and muscle

- The neuron-structure and functions
- Properties of nerve fibres
- Physiology of action potential including compound action potentials
- Conduction of nerve impulse, nerve degeneration and regeneration
- Synapses
- Types of muscle, functions
- Skeletal muscle contraction
- Isometric and isotonic contraction
- Smooth muscle contraction
- Neuromuscular junction
- Excitation-contraction coupling
- Motor unit
- Neuromuscular junction blockers

Clinical/Applied Concepts

- Nerve conduction studies
- Electromyograms (EMG)
- Nerve injury
- Rigor mortis and contractures
- Myasthenia gravis
- Myopathies/Neuropathies

Cardiovascular system

- Introduction to heart and circulation
- Properties of cardiac muscle
- Action potential in atrial and ventricular muscle and pace-maker potential
- Artificial pacemaker
- Cardiac impulse- origin and propagation
- Cardiac cycle Regulation of cardiac functions
- ECG-recording and interpretation
- Arrhythmias- mechanism of development
- Functional types of blood vessels
- Haemodynamics of blood flow
- Local control of blood flow
- Systemic circulation - basic principles/characteristics and control
- Cardiac output (regulation/measurement) peripheral resistance and its regulation
- Arterial pulse
- Arterial blood pressure (short/long term regulation)
- Heart sounds/murmurs
- Venous return and its regulation
- Coronary circulation
- Splanchnic circulation
- Cerebral circulation
- Cutaneous circulation- Triple response
- Foetal circulation and readjustments at birth
- Cardiovascular changes during exercise

Clinical/Applied Concepts

- Correlation of cardiac cycle with Electrocardiogram (ECG) and heart sounds
Echocardiogram
- Significance of apex beat / abnormalities
- ECG interpretation in cardiac muscle abnormalities and cardiac arrhythmias
- Flutter, fibrillation, ectopic beats
- Conduction defects

- Radial/other pulses
- Hypertension, types and effects
- Clinical evaluation of heart sounds and murmurs
- Jugular venous pulse
- Ischemic heart disease
- Cerebrovascular accidents
- Types of heart failure and circulatory shock

Respiratory system

- Organization/functions of respiratory tract
- Functions of lungs (respiratory and non-respiratory)
- Mechanics of breathing, pulmonary pressure changes
- Surfactant and compliance
- Protective reflexes
- Lung volumes and capacities
- Dead spaces
- Diffusion of gases (gas laws, composition)
- Pulmonary Circulation Ventilation / perfusion
- Transport of O₂ in blood O₂/CO₂ disassociation curves
- Transport of CO₂ in blood
- Regulation of respiration (nervous/chemical)
- Abnormal breathing
- Hypoxia-types and effects
- Physiology of cyanosis
- Physiology of high altitude, space, deep sea diving
- Oxygen debt
- Respiratory changes during exercise

Clinical/Applied Concepts

- Examination of chest
- Types of respiration (intrapleural pressure, pneumothorax, effusion)
- Atelectasis
- Lung function tests (Spirometry)
- Sneezing, yawning, cough
- Obstructive / Restrictive lung disease (FEV₁/FVC)
- Abnormal Ventilation / Perfusion
- Respiratory failure: Types I & II
- Asphyxia
- Hypoxia, cyanosis, dyspnoea, hypo- and hypercapnoea
- Artificial respiration
- Oxygen therapy and its toxicity

- Caisson's disease

Body fluids and kidneys

- Compartments of body fluids and measurement
- Tissue and lymph fluids
- Fluid excess / depletion
- Structure of kidney / nephron
- General functions of kidney
- GFR-factors regulating
- Formation of urine, filtration, reabsorption, secretion
- Plasma clearance
- Concentration and dilution of urine
- Electrolyte balance
- Water balance
- Regulation of blood pressure by kidneys
- Hormones of kidneys
- Acidification of urine
- Acid-Base balance
- Micturition

Clinical/Applied Concepts

- Renal function tests
- Renal failure/uraemia
- Nephrotic syndrome
- Artificial kidney/haemodialysis
- Metabolic acidosis/alkalosis
- Abnormalities of micturition including incontinence

Gastrointestinal tract (GIT)

- Different parts of the GIT and their functions
- Enteric nervous system (gut, brain)
- Mastication, swallowing and their control
- Functions and movements of stomach Functions of pancreas
- Functions and movements of small intestine
- Functions and movements of large intestine
- Hormones of GIT
- Vomiting and its pathway
- Defecation and its pathway Regulation of feeding and energy expenditure
- Functions of liver/gall bladder

Clinical/Applied Concepts

- Dysphagia, achalasia of oesophagus
- Examination of abdomen, peptic ulcer, pancreatitis
- Gastric function tests
- Vomiting and its effects
- Diarrhoea, constipation
- Jaundice, liver functions tests

Nervous system

- Organization of nervous system
- Classification of nerve fibres
- Properties of synaptic transmission
- Neurotransmitters and neuropeptides
- Types and function of sensory receptors
- Functions of spinal cord and tracts
- Reflex action/reflexes
- Muscle spindle/muscle tone
- Tactile, temperature and pain sensations Structure of cerebral cortex
- Sensory Cortex
- Motor Cortex
- Motor pathways (pyramidal and extra pyramidal)
- Basal ganglia, connections and functions
- Cerebellum, connections and functions
- Vestibular apparatus/regulation of posture and equilibrium
- State of brain activity Reticular formation
- Physiology of sleep
- Electroencephalogram (EEG) Physiology of memory
- Physiology of speech
- Thalamus- nuclei and functions
- Hypothalamus and limbic system
- Cerebrospinal fluid
- Regulation of body temperature
- Function of skin
- Autonomic nervous system

Clinical/Applied Concepts

- Significance of dermatomes
- Receptors and neurotransmitters (applied aspect)
- Interpretation of reflexes
- Injuries and diseases of spinal cord, analgesia system

- Disorders of cranial nerves
- Hemiplegia / paraplegia, Upper and lower motor neuron lesions: features and localisation
- Parkinsonism and other lesions of basal ganglia
- Cerebellar disorders
- Postural disorders
- Epilepsy
- Sleep disorders
- Higher mental function assessment
- Alzheimer's disease
- Abnormalities of speech
- Thalamic syndrome
- Lesion of hypothalamus
- Hydrocephalous
- Heat Stroke

Special senses

- Structure and functions of eyeball
- Principles of optics
- Accommodation of eye
- Visual acuity
- Photochemistry of vision
- Colour vision
- Dark and light adaptation Neural function of retina
- Visual pathway, light reflex and pathway Visual cortex
- Eye movements and control
- Physiological anatomy of cochlea
- Functions of external and middle ear
- Functions of inner ear- organ of Corti
- Auditory pathway
- Physiology of smell - receptors and pathway
- Physiology of taste
- Olfaction/taste abnormalities

Clinical/Applied Concepts

- Glaucoma
- Errors of refraction
- Colour blindness, fundoscopy
- Field of vision and lesions of visual pathway, visual evoked potentials and electroretinogram
- Rinne's and Weber's tests
- Hearing test audiometry, types of deafness, auditory evoked potentials

Endocrinology

- General principles (classification, mechanism of action, feedback control)
- Biosynthesis, transport, metabolism, actions and control of secretion
- of hormones of:
 - Hypothalamus
 - Anterior pituitary
 - Posterior pituitary
 - Thyroid gland
 - Parathyroid, calcitonin and calcitriol
 - Adrenal medulla
 - Adrenal cortex
 - Pancreas
 - GIT
 - Pineal gland
 - Thymus
 - Kidney
 - Physiology of growth

Clinical/Applied Concepts

- Hormonal assays
- Panhypopituitarism, dwarfism acromegaly, gigantism, Sheehan's syndrome
- Diabetes insipidus, syndrome of inappropriate ADH secretion
- Myxoedema, cretinism, thyrotoxicosis
- Tetany
- Pheochromocytoma
- Cushing's syndrome, Conn's syndrome, Addison's disease, adrenogenital syndrome
- Diabetes mellitus and hypoglycemia, Zollinger Ellison's syndrome

Reproduction

- Functional anatomy of male reproductive system
- Spermatogenesis
- Semen analysis
- Erection and ejaculation
- Testosterone
- Male puberty
- Functional anatomy and physiology of female Reproductive system, gonads and oogenesis
- Oestrogen and progesterone
- Menstrual cycle
- Puberty and menopause

- Pregnancy- physiological changes in mother's body during pregnancy
- Placenta
- Parturition
- Lactation
- Foetal and neonatal physiology

Clinical/Applied Concepts

- Chromosomal abnormalities
- Male infertility
- Female infertility
- Contraception
- Pregnancy Tests

BIOCHEMISTRY

Cell Biochemistry

- Introduction to biochemistry
- Biochemical composition and functions of the cell
- Biochemistry of eukaryotes, prokaryotes and archaea
- Cell membranes and their chemical composition
- Importance of lipids and proteins in cell membranes
- Signaling pathways and receptors
- Methods to study cell biochemistry (microscopy, centrifugation, Spectrophotometry, chromatography, electrophoresis and thermal cycler)

Body fluids and pH regulation

- Ionization of water, weak acids and bases
- pH and pH scale
- pK values, dissociation constant and titration curve of weak acids
- Body buffers and their mechanism of action
- Henderson – Hasselbach's equation
- Acid base regulation in human body
- Biochemical mechanisms for control of water and electrolyte balance.

Carbohydrates

- Definition, biochemical function and classification
- Structure and functions of monosaccharides and their derivatives
- Disaccharides and their important examples
- Oligosaccharides and their combination with other macromolecules
- Polysaccharides and their important examples and biochemical role

- Biochemical importance of carbohydrates

Proteins

- Definitions, biochemical importance and classification of proteins based on physiochemical properties
- Amino acids and their structure, properties and functions
- Classification and nutritional significance of amino acids
- Dissociation, titration and importance of amino acids
- Structure of proteins and their significance in pH maintenance
- Separation of proteins e.g. salting out, electrophoresis, chromatography, centrifugation
- Immunoglobulins and their biomedical significance
- Plasma proteins and their clinical significance

Nucleotides and Nucleic Acids

- Chemistry of purines and pyrimidines, their types, structure and function
- Chemistry and structure of nucleoside and nucleotide and their biochemical role
- Derivatives of purines and pyrimidines, their role in health and disease
- Nucleic acids, their types, structure and functions (gout)

Lipids and Fatty Acids

- Classification of lipids and their biochemical functions
- Structure and biochemical function of phospholipids, glycolipids and sphingolipids
- Classification of fatty acids and their biochemical functions
- Functions of essential fatty acids
- Identification of fats and oils (saponification, acid number)
- Eicosanoides and their function in health and disease (overview)
- Steroids and their biochemical role
- Cholesterol, its structure, chemistry and functions
- Lipid peroxidation and its significance

Enzymes

- Classification/nomenclature
- Properties of enzymes and catalysts
- Functions of enzymes and catalysts
- Co-enzymes and co-factors
- Isozymes and their clinical importance
- Factors affecting enzyme activity (Michaelis – Menten and Lineweaver burk equations) Classification of enzyme inhibitors and their biochemical importance
- Therapeutic use and application of enzymes in clinical diagnosis

Porphyryns and Haemoglobin

- Chemistry and biosynthesis of porphyryns and related disorders
- Structures, functions and types of haemoglobin
- Oxygen binding capacity of haemoglobin, factors affecting and regulating the oxygen binding capacity of haemoglobin
- Degradation of haeme, formation of bile pigments, its types, transport and excretion
- Hyperbilirubinemia, biochemical causes and differentiation
- Haemoglobinopathies (Hb-S, Thalassemia etc.) and their biochemical causes

Vitamins and minerals

- Vitamins and their different types
- Classification of vitamins, their chemical structure and biochemical function
- Absorption of vitamins and minerals
- Daily requirements, sources of water and fat soluble vitamins
- Effects of vitamin deficiency
- Role of vitamins as co-enzymes
- Hypo- and hyper-vitaminosis
- Minerals in human nutrition, sources, biochemical actions and recommended daily allowance (RDA).
- Sodium, potassium, chloride, calcium, phosphorus, magnesium, sulfur, iodine, fluoride
- Trace elements (Fe, Zn, Se, I, Cu, Cr, Cd and Mn)

Nutrition

- Caloric requirements of the body
- Balanced diet
- Nutritional requirements in:
 - pregnancy
 - lactation
 - newborn, youth and old age
- Nutritional disorders and protein energy malnutrition (Marasmus, Kwashiorkor and Marasmic-Kwashiorkor)

Bioenergetics and Biological Oxidation:

- Endergonic and exergonic reactions, coupling through ATP
- Oxidation and reduction, methods of electron transfer, redox potential, enzymes and coenzymes of biologic oxidation and reduction
- Respiratory chain and oxidative phosphorylation, components of respiratory chain, electron carriers

- ATP synthesis coupled with electron flow
- ADP coupled to electron transfer
- ATP synthase- relation to proton pump, PMF, and active transport
- Uncouplers and inhibitors of oxidative phosphorylation

Introduction to metabolism

Metabolism of carbohydrates

- Glycolysis
- Phases and reactions of glycolysis
- Energetics of aerobic and anaerobic glycolysis and their importance
- Regulation of glycolysis
- Cori's cycle
- The fate of pyruvate
- Citric Acid Cycle
- Reactions, energetics and regulation and importance of citric acid cycle
- Amphibolic nature of citric acid cycle (tricarboxylic acid cycle – TCA or the Krebs's cycle)
- Anaplerotic reactions and regulations of TCA cycle
- Gluconeogenesis
- Important three by-pass reactions of gluconeogenesis
- Entrance of amino acids and intermediates of TCA cycle and other nutrients as gluconeogenic substrates
- Significance of gluconeogenesis
- Glycogen metabolism
- Reactions of glycogenesis and glycogenolysis
- Importance of UDP-Glucose
- Regulation of glycogen synthase and glycogen phosphorylase
- Glycogen phosphorylase A and the blood glucose sensor
- Disorders of glycogen metabolism (glycogen storage diseases)
- Secondary pathways of carbohydrate metabolism
- Hexose Mono Phosphate (HMP) shunt, its reactions and importance
- Glucuronic acid pathway, its reactions and importance
- Metabolism of fructose, galactose and lactose
- Regulation of Blood Glucose level
- Hyperglycemia, hypoglycemia and their regulating factors
- Biochemistry of Diabetes Mellitus, its laboratory findings and diagnosis

Metabolism of Lipids:

- Mobilization and transport of fatty acids, triacylglycerol and sterols
- Oxidation of fatty acids
- Activation and transport of fatty acid in the mitochondria

- β -oxidation, fate of acetyl CoA, regulation of β -oxidation
- Other types of oxidation, i.e. α -oxidation, ω -oxidation, peroxisome
- oxidation, oxidation of odd number carbon-containing fatty acids and unsaturated fatty acids etc.
- Ketogenesis
- Mechanism and utilization of ketone bodies and significance
- Ketosis and its mechanism
- Biosynthesis of fatty acids
- Eicosanoids, synthesis from arachidonic acid, their mechanism and biochemical functions
- Triacylglycerol synthesis and regulation
- Synthesis and degradation of phospholipids and their metabolic disorders
- Cholesterol synthesis, regulation, functions, fate of intermediates of cholesterol synthesis, hypercholesterolemia, atherosclerosis
- Plasma lipoproteins, VLDL, LDL, HDL, and chylomicrons, their transport, functions and importance in health and disease
- Glycolipid metabolism and abnormalities

Metabolism of Proteins and Amino acids:

- Amino acid oxidation, metabolic fates of amino acid, transamination, deamination decarboxylation, deamidation and transamination
- Transport of amino group, role of pyridoxal phosphate, glutamate, glutamine, alanine
- Ammonia intoxication, nitrogen excretion and urea formation, urea cycle and its regulation, genetic defects of urea cycle
- Functions, pathways of amino acid degradation and genetic disorders of individual amino acids

Integration and regulation of metabolic pathways in different tissues

Metabolism of nucleotides:

- De novo purine synthesis
- Synthesis of pyrimidine
- Recycling of purine and pyrimidine bases (Salvage pathway)
- Degradation of purine, formation of uric acid
- Disorders of purine nucleotide metabolism

Biochemical genetics (informational flow in the cell):

- The structural basis of the cellular information
- DNA, chromosomes - discovery and organization of DNA in genomes
- Nucleosome structure and function
- Super-coiling of DNA
- DNA replication (DNA-dependent DNA synthesis)
- DNA polymerase, its components and functions

- Initiation, elongation and termination of replication
- DNA repair, mutation and cancers
- Transcription (DNA-dependent RNA synthesis)
- RNA polymerase, its components and functions
- Initiation, elongation and termination of transcription
- RNA processing
- RNA-dependent synthesis of RNA and DNA
- Reverse transcription DNA synthesis from viral RNA
- Retroviruses in relation to cancer and AIDS
- Translation (Protein synthesis)
- The genetic code
- Initiation, elongation and termination of protein synthesis
- Post-translational modification
- Regulation of gene expression
- Molecular biology technology
- DNA isolation
- DNA-recombinant technology
- Hybridization, blotting techniques
- Epigenetics
- Genetic disorders

Biochemistry of Endocrine system:

- Synthesis, secretion, mechanism of action and regulation of hormones
- Hormone effect on carbohydrate, lipid, protein, mineral metabolism
- Disorders of various endocrine glands

Biochemistry of Water and Electrolyte Imbalance and Acid-Base balance

ANNEXURE III

Syllabus for NEB Examination (Medical) Standard 4 (for transfer to MBBS Year 4)

PHARMACOLOGY AND THERAPEUTICS

General Pharmacology:

- Definition & Branches/divisions of pharmacology, objectives of learning pharmacology.
- Definition of drug, drug nomenclature & sources of drugs.
- Standard sources of drug information, Pharmacopoeas and Formularies (only relevant information)
- Dosage forms and doses of drugs.
- Pharmacokinetics: basic principles and their clinical application
- Route of drug administration.
- Transport of drugs across cell membranes
- Absorption of drugs and bioavailability
- Drug reservoirs, distribution and redistribution of drugs, plasma protein binding and volume of distribution.
- Bio-transformation of drugs.
- Excretion of drug, enterohepatic recirculation, plasma half-life, clearance
- Pharmacodynamics
- Mechanism of drug action.
- Receptors and post receptor molecular mechanism of drug action
- Mechanism of drug action other than mediated through drug receptors.
- Dose response curves, structure-activity relationship.
- Factors modifying action and doses of drugs.
- Pharmacogenetics.
- Adverse drug reactions & drug toxicity/poisoning
- Drug Interactions

Locally Acting Drugs (definitions with examples)

- Dermatological and topical drugs
- Demulcents, emollients, irritants, counter irritants, astringents.
- Antiseborrheics, locally acting enzymes.
- Antiseptics and disinfectants.

Autacoids

- Histamine & antihistamines
- Introduction to other Mediators:
- Eicosanoids
- Serotonin
- Substance P
- Bradykinin

Drugs Acting on Gastrointestinal Tract:

- Emetics and anti-emetics.
- Pharmacotherapy of Peptic ulcer disease,
- Pharmacotherapy of Constipation
- Pharmacotherapy of Diarrhea
- Pharmacotherapy of irritable bowel syndrome
- Prokinetics

Drugs Acting on Autonomic Nervous System:

- Neurohumoral Transmission
- Parasympathetic nervous system
- Parasympathomimetics
- Parasympatholytics
- Autonomic ganglionic stimulants and blockers
- Skeletal muscle relaxants
- Sympathetic nervous system
- Sympathomimetics
- Sympatholytics
- Adrenergic neuron blockers

Drugs acting on renal system

- Diuretics
- Anti-Diuretics
- Drugs for acid base and electrolyte balance

Drugs acting on Cardiovascular System

- Antihypertensive drugs.
- Anti-anginal drugs
- Drug management of C Heart F and Inotropic drugs.
- Thrombolytics/anticoagulants/antiplatelets.
- Anti-arrhythmic drugs.
- Antihyperlipidemic drugs.
- Drugs used in anaemias

Drugs Acting on Respiratory System

- Pharmacotherapy of cough:
- Antitussives, Expectorants and Mucolytics.
- Bronchial asthma.

Drugs Acting on Endocrine System

- Pituitary-hypothalamic drugs.
- Thyroid antithyroid drugs.
- Pancreatic hormones and anti-diabetic drugs.

- Adrenocorticoids.
- Anabolic steroids.
- Reproductive hormones: Testosterone, Estrogen, Progesterone,
- Contraceptives

Drugs acting on Central Nervous System

- Introduction to CNS Neuronal organisation and Neurotransmitters
- Sedative-hypnotics, Pharmacotherapy of sleep disorder
- Pharmacotherapy of Epilepsy, Parkinsonism, Migraine.
- Psychopharmacology: antipsychotics, antidepressants, anxiolytics, anti-mania drugs
- Anaesthetics: Local and general anaesthetics.
- CNS stimulant drugs
- Pharmacotherapy of Pain and inflammation:
- Opioids and Non-Steroidal Anti-inflammatory Drugs (NSAIDs)
- Pharmacotherapy of Gout, Rheumatoid arthritis
- Drugs for movement disorder/muscle relaxant.

Drugs Acting on Uterus

- Drugs increasing and drugs decreasing uterine motility
- Drugs decreasing uterine motility

Chemotherapy

- Introduction to chemotherapy
- Antimicrobials acting on cell wall
- Protein synthesis inhibitors
- Nucleic acid synthesis inhibitors
- Antifolates
- Gyrase inhibitors
- Anti-mycobacterial drugs.
- Anti-fungal drugs.
- Antiviral drugs.
- Anti-protozoal drugs: Antimalarials and Anti-amoebic drugs.
- Chemotherapy for Sexually Transmitted Diseases (STDs)
- Cancer chemotherapy: Principle and general consideration, treatment approach in some common malignancies

Immunopharmacology

- Immunostimulants including Probiotics
- Immunosuppressants
- Vaccines and sera

Miscellaneous

- Pharmacotherapy of Glaucoma and Cataract
- Pharmacotherapy of anaemias

- Drug therapy in children, elderly, during pregnancy and lactation.
- Drug therapy in disease states such as renal and hepatic disease.
- Overview of radiation therapy.

PATHOLOGY AND MICROBIOLOGY

GENERAL PATHOLOGY

- Differentiate between normal and altered state of homeostasis
- recognize various types and causes of cell injuries and cell death.
- understand the pathogenesis and morphology of necrosis and apoptosis
- knowledge of cell adaptation (physiological / pathological)
- describe the various cellular accumulation

CELL INJURY

- Definition of necrosis, apoptosis, ischemia, hypoxia, infarction and gangrene.
- Sequence of the structural and biochemical changes which occur in the cell in response to the following:
 - Ischemia
 - Immunological injury e.g. Asthma /SLE/ Anaphylactic reaction
 - Physical agents: e.g. Radiation
 - Genetic defects e.g. Thalassaemia / haemophilia
 - Nutritional deficiency e.g. anemia
 - Infectious agents
 - Viruses: e.g. Hepatitis
 - Bacteria: e.g. Staphylococcus aureus
 - Fungi: e.g. Candida
 - Parasites: e.g. Malaria
 - Irreversible and reversible injury.
 - Critical mechanisms in cell injury.
 - Especially with reference to ATP, mitochondria, calcium ions and
 - Cell membrane
 - Role of free radicals
 - Apoptosis and its significance.
 - Exogenous and endogenous pigment deposition.
 - Dystrophic and metastatic calcification along with clinical significance.
 - Metabolic disorders
 - Lipid disorders, steatosis of liver, hyperlipidemia
 - Protein disorders
 - Carbohydrate disorders
 - Adaptation to cell injury, atrophy, hypertrophy, hyperplasia,
 - Metaplasia, dysplasia.

- The necrosis and its types.
- Patterns of necrosis, the mechanism and characteristic gross and
- Microscopic findings
- The term gangrene and its pathological mechanism
- Intracellular accumulations
- Hyaline change

INFLAMMATION AND NEOPLASIA

- Vascular and cellular events with chemical mediations in acute and
- Chronic inflammation with
- sequelae of acute inflammation
- transudate and exudate
- types of chronic inflammation (simple and granulomatous) and
- Their effector cells with functions
- morphologic patterns of chronic inflammation
- sequence of events in formation, types and causes of granuloma
- the different types of necrosis with prototypic examples
- role of complement in inflammation and immunity with various cellular events
- structure and formation of antibodies with their functions
- characteristic of bacterial structure with its virulence and pathogenesis
- the structure (cell wall) of bacteria with their staining properties
- (Gram stain)
- histology of lymph node with their normal and abnormal functions
- proto-oncogenes, oncogenes, tumor suppressor genes and
- Apoptosis regulating genes in carcinogenesis with their mode of activation and with common human tumours
- tumour markers with their use in clinical practice
- the virulence factors of Streptococci and Staphylococci with acute Inflammation

WOUND HEALING

- Differences between repair and regeneration.
- Wound healing by first and second intention.
- Factors that influence the inflammatory reparative response.
- Wound contraction with cicatrization.
- Formation of granulation tissue.
- Complications of wound healing.

DISORDERS OF CIRCULATION

Thrombo-embolic disorders and their modalities:

- Hemorrhage and congestion
- Pathogenesis of thrombosis.
- Possible consequences of thrombosis
- Define and classify emboli according to their composition.
- Infarction: red (hemorrhagic) and white (anemic)

Disorders of the circulation and shock:

- Definition of edema, ascites, hydrothorax and anasarca.
- Pathophysiology of edema with special emphasis on Congestive Heart Failure (CHF).
- Pathogenesis of four major types of shock (hypovolemic, cardiogenic, vasovagal & septic) and their causes.
- Compensatory mechanisms involved in shock.

MICROBIOLOGY

- Defense mechanisms of the body.
- Microbial mechanisms of invasion and virulence.
- Differentiation between sterilization and disinfection.
- Appropriate methods of disinfection and sterilization for the following:
- Spillage: blood and body fluids such as sputum, vomitus, stool, urine,
- Principles of aseptic techniques for venepuncture, urinary catheterisation, wound dressing, suturing and lumbar puncture.
- Healthcare associated infections and basic concepts of infection control including standard precautions
- General principles of the following serological tests:
- Precipitation (VDRL) and agglutination (Latex particle) and Haemagglutination TPHA test
- Immunofluorescent FTA
- ELISA Hepatitis (A, B, C,D,E,) Rubella, Cytomegalovirus (CMV) and Human Immunodeficiency Virus (HIV)
- Western blot for HIV
- ICT Hepatitis Band C.
- Interpretation:
- Culture reports,
- Serological reports and
- Microscopic reports of Gram and AFB stain.
- Laboratory diagnosis of infectious diseases: Principles of proper sample collection and submission of specimens for laboratory investigations with due precautions.
- Classification of microorganisms: General characteristics and taxonomy of Bacteria, Rickettsia, Chlamydia, Viruses and Fungi.

- Definition of communicable endemic, epidemic and pandemic diseases, carriers, pathogens, opportunists, commensals and colonizers.
- Micro-organisms responsible for infection of the following organ systems:
 - Central nervous system
 - Respiratory system
 - Gastrointestinal system
 - Genital infections
 - Urinary system
 - Infections of bone and joints
 - Systemic infections
 - Infection of the skin
 - Hepatobiliary and pancreatic infections
 - Zoonosis
- Pathogenesis, treatment, epidemiology, prevention and control of following organisms.

Bacteria

- Staphylococcus aureus
- Streptococcus pneumoniae
- Beta hemolytic streptococcus group A & B
- Diphtheria sp
- Bordetella sp
- Bacillus anthracis
- Clostridia (perfringens, botulinum, difficile, tetani),
- Actinomyces israeli
- Nocardia asteroides
- Neisseria (meningitidis and gonorrhoeae)
- Gardnerella vaginalis, Ha
- mophilus influenzae,
- Mycobacterium tuberculosis and leprae
- Escherichia coli
- Klebsiella
- Proteus
- Salmonella
- Shigella
- Yersinia pestis
- Pseudomonas
- Vibrio cholera
- Vibrio parahemolyticus
- Campylobacter jejuni
- Helicobacter pylori
- Legionella
- Lycoplasma pneumoniae
- Chlamydia

- Treponema pallidum
- Leptospira
- Rickettsia sp.

Viruses

- Enterovirus
- Mumps
- Herpes
- Adenovirus
- Measles
- Influenza,
- Parainfluenza
- Rhinovirus
- Respiratory Syncytial Virus (RSV)
- Hepatitis A, B, C, D, E
- Rotavirus
- Astrovirus
- Cytomegalo Virus (CMV),
- bstein Barr
- Virus (EBV)
- Rubella
- Chicken pox
- Arbovirus
- HIV
- Rabies.

Fungus

- Cryptococcus neoformis
- Candida albicans
- Tinea species

PARASITOLOGY

Protozoa

- Plasmodium species
- Giardia lamblia
- Entamoeba histolytica
- Leishmania species
- Trichomonas vaginalis
- Toxoplasma gondii
- Pneumocystis carinii
- Trypanosoma
- Balantidium coli

Helminths

Cestodes

- Taenia (Solium, Saginata)
- Echinococcus species
- Hymenolepis nana
- Diphyllbothrium latum.

Nematodes

- Filaria species
- Ascaris lumbricoides
- Ancylostoma duodenale,
- Enterobius vermicularis
- Trichuris trichiuria
- Trichinella spiralis
- Strongyloides stercoralis
- Loa Loa.

Trematodes

- Schistosoma (Haematobium, Mansoni, Japonicum)
- Fasciola
- Hepatica
- Clonorchis sinensis

PRINCIPLES OF ANTI-MICROBIAL ACTION

- Definitions: antibiotics, selective toxicity, bacteriostatic and bactericidal.
- Host determinants in relation to selection of an antimicrobial drug for therapy.
- Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC)
- Bacterial resistance and the mechanisms involved in acquiring bacterial resistance.
- Mechanisms involved in transfer of drug resistance to bacterial resistance.
- Mode of action of various antimicrobial drug groups.
- Cross resistance
- Super infection

ANNEXURE IV

Syllabus for NEB Examination (Medical) Standard 5 (for transfer to MBBS Year 5)

SYSTEMIC PATHOLOGY

BLOOD VESSELS AND HEART

- Differentiation between atherosclerosis, Monckeberg's medial calcific sclerosis and arteriosclerosis.
- Etiology, pathogenesis & complications of atherosclerosis.
- Types of primary and secondary hypertension and vascular changes in hypertension.
- Common pathogenic mechanisms of vasculitis.
- Aneurysms, classification, and aetiology and pathogenesis of atherosclerotic aneurysm
- Pathology of varicose veins
- Benign and malignant tumors of blood vessels.
- Pathogenesis of ischemic heart disease including etiological factors, pathogenesis, diagnosis and complications of Myocardial infarction.
- Causes of sudden cardiac death
- Cor-pulmonale and list the predisposing disorders
- Rheumatic fever with respect to aetiology, pathogenesis, morphological and clinical features. The sequelae of Rheumatic Fever.
- Infective endocarditis with respect to aetiology, pathogenesis, morphological and clinical features, and its sequelae
- Myocarditis: causes and its morphological and clinical features
- Cardiomyopathy: clinico-pathological groups and diagnosis
- Causes of pericarditis and its clinical and morphological features
- Primary and secondary cardiac tumors
- Main features of Fallot's tetralogy and coarctation of aorta, Valvular heart disease and mitral valve prolapse
- The concept of cardiac transplantation

HAEMATOPOIETIC AND LYMPHOID SYSTEMS

- Stages in the formation of red blood cells (RBCs), white blood cells (WBCs), platelets and correlate hematopoiesis with various hematopoietic growth factors including morphology of a normal bone marrow.
- Normal values of red cell count, hemoglobin level, packed cell volume, MCH, MCV, MCHC, WBC count and platelet count.
- Anemias, classification on the basis of morphology and underline pathogenesis of RBC production.
- Causes and clinical features, clinical presentation, and diagnosis of hypochromic anemia, Megaloblastic Anemia, Anemia of chronic disease, Hereditary spherocytosis, Aplastic anemia and Hemolytic Anemias.

- Aetiology, pathogenesis, clinical types, diagnosis of thalassemia with emphasis on incidence, common mutations, associated psychosocial problems and prevention.
- Inheritance, clinical features, lab diagnosis of von Willebrand's disease, Hemophilia A & B and Polycythemia.
- Mechanisms which can cause neutropenia/agranulocytosis.
- Differentiation between infective and malignant causes of leucocytosis with special reference to infectious mononucleosis, acute and chronic non-specific lymphadenitis.
- Non-Hodgkin's lymphoma, classification and diagnosis.
- Classification, aetiology, pathogenesis and clinical stages of Hodgkin's disease
- Aetiology, clinical features, laboratory diagnosis and prognostic factors of acute and chronic lymphoblastic and myeloblastic leukemia.
- Multiple myeloma with respect to aetiology, pathogenesis, morphology, clinical features and diagnosis.
- Disseminated intravascular coagulation with respect to aetiology, pathogenesis, clinical features and laboratory diagnosis
- Causes of decreased production and decreased survival of Platelets with special reference to the pathogenesis of idiopathic & thrombotic thrombocytopenic purpura
- The value of coagulation profile in the assessment of bleeding disorders
- ABO and Rhesus blood groups, their clinical importance and method of group typing.
- Common indications of blood products (red cells, platelets and plasma) and hazards of blood transfusion and methods of their prevention.

RESPIRATORY SYSTEM

- Differentiate between pleural effusion, hemothorax, hydrothorax, pleuritis, pneumothorax and chylothorax.
- Classification of atelectasis on the basis of underlying mechanisms.
- Etiology, pathogenesis, morphology and clinical features and diagnosis of asthma.
- Disorders associated with airflow obstruction disease with reference to their aetiology, Pathogenesis, morphology and diagnosis
- Restrictive lung diseases including sarcoidosis, pulmonary eosinophilia, with reference to their aetiology, Pathogenesis, morphology and clinical diagnosis
- Pathogenesis, morphology and clinical features of adult respiratory distress syndrome.
- Clinical features of Goodpasture's syndrome based on the pathology.
- Morphology & clinical features of pulmonary infarction.
- Causes of pulmonary hypertension and vascular sclerosis.
- Etiology, pathogenesis, morphology and clinical Features, complications and clinical diagnosis of acute and chronic pneumonias including atypical pneumonia.
- Etiology, pathogenesis and clinical features, clinical diagnosis of tuberculosis of the lung.
- Classification, aetiology, pathogenesis and clinical features of different lung tumors.

GASTROINTESTINAL TRACT AND LIVER

- Risk factors, clinical and morphological features and diagnosis of oral Cancer with special reference to early lesions like leucoplakia.
- Benign and malignant tumors of salivary glands.
- Different types of esophagitis and its relation with carcinoma of the esophagus.
- Predisposing factors, pathogenesis, morphological and clinical features of acute and chronic gastritis and peptic ulcer disease.
- Gastric carcinoma with respect to risk factors, pathogenesis, clinical and morphological features and prognosis; and differentiate from Gastric Lymphoma and Gastrointestinal Stromal Tumor (GIST).
- Clinical and morphological features of Hirschsprung's disease.
- Pathogenesis, morphological and clinical features of malabsorption diseases.
- Predisposing conditions, clinical and morphological features of ischemic bowel disease.
- Crohn's disease and ulcerative colitis including major causes of intestinal obstruction.
- Clinico-pathological features, clinical presentation and diagnosis of bacterial and parasitic diseases of intestines.
- Benign and malignant tumors of intestines with reference to etiological factors, pathogenesis, diagnosis and prognosis.
- Types of jaundice with respect to the causes, clinical features and laboratory diagnosis
- Causes, morphological and clinical features and complications of hepatic failure
- Causes, pathogenesis, complications of cirrhosis
- Route of transmission, Incubation period, Clinical features and complications of acute and chronic viral hepatic infection.
- Liver abscess: causes, clinical features, diagnosis
- Pathogenesis, clinical features and diagnosis of alcohol liver disease.
- Clinico-morphological features and diagnosis of deposition diseases of liver.
- Neonatal hepatitis.
- Epidemiology, pathogenesis, morphological and clinical features of hepatocellular carcinoma.
- Pathogenesis and risk factors of Cholelithiasis and acute and chronic cholecystitis.
- Features of gall bladder cancer.
- Acute and chronic pancreatitis with respect to aetiology, pathogenesis, clinical and morphological features.
- Clinical and morphological features of carcinoma of pancreas.

RENAL AND MALE REPRODUCTIVE SYSTEM

- Etiology, pathogenesis, clinical features and complications of; Azotemia, Uremia, Acute renal failure, Chronic renal failure
- Polycystic kidney disease (and its Classification)
- Glomerulonephritis and (its Classification)
- Nephrotic and nephritic syndrome
- Acute and chronic pyelonephritis.

- Hydronephrosis
- Pathogenesis and clinical course of acute tubular necrosis.
- Benign and malignant nephrosclerosis
- Characteristics of various types of renal stones
- Pathogenesis, clinical features and lab diagnosis of nephrolithiasis
- Epidemiology, morphology, clinical features and prognosis of Wilm's tumor
- Classification, Epidemiology, morphology, clinical features and prognosis of renal cell carcinoma
- Etiology, morphology & clinical features of cystitis.
- Clinical features, etiology and morphology of transitional cell carcinoma of the urinary bladder.
- Etiology, route of infection, pathogenesis and methods of diagnosing Gonococcal and non-gonococcal urethritis
- Etiology, pathogenesis, diagnosis of prostatitis, prostatic hyperplasia and prostatic carcinoma
- Inflammatory disease and tumors of testis and epididymis
- Causes, pathogenesis and investigations of male infertility.

FEMALE GENITAL SYSTEM AND BREAST

- Causes, routes of infection and methods of diagnosis of Sexually transmitted diseases: micro-organisms involved, route of infection, pathogenesis and methods of diagnosis
- Vulvar and vaginal squamous intraepithelial lesions
- Neoplasms of Cervix with reference to cervical intraepithelial neoplasia.
- Causes, pathogenesis and clinical features of dysfunctional uterine bleeding and its relation with endometrial hyperplasia, endometrial polyp and carcinoma.
- Clinical features and pathogenesis of adenomyosis and endometriosis.
- Tumors of endometrial stroma and myometrium.
- Tumors of the ovary: classification, etiological factors, pathogenesis, diagnosis and prognosis.
- Etiology, clinical features and pathogenesis of ectopic pregnancy and toxemia of pregnancy.
- Gestational trophoblastic tumors
- Causes of nipple discharge and lump breast and its differentiation on the basis of aetiology, pathogenesis, morphology, clinical features, diagnosis and complications
- Benign breast diseases proliferative and non- proliferative
- Carcinomas of the breast: Epidemiology, classification, aetiology and pathogenesis, diagnosis and prognosis
- Gynecomastia and list its causes.

MUSCULOSKELETAL SYSTEM

- Pathogenesis, clinical features and diagnosis of genetic and metabolic bone diseases.
- Causes of osteoporosis, its pathogenesis, morphological and clinical features.

- Acute and chronic Osteomyelitis with respect to causative organisms, routes of spread, and complications.
- Benign and malignant bone forming tumors
- Benign and malignant cartilaginous tumors
- Pathogenesis, morphological and clinical features of Degenerative Arthritis
- Pathogenesis, morphological and clinical features of immune mediated arthritis
- Pathogenesis, morphological and clinical features of crystal deposition diseases.
- Pathogenesis, morphological and clinical features and diagnosis of muscular dystrophies
- Pathogenesis, morphological and clinical features and diagnosis of inflammatory myopathies
- Clinico-pathological features of Myasthenia Gravis
- Classification and important distinguishing points of soft tissue tumors

ENDOCRINE SYSTEM

- Causes, Pathogenesis, and diagnosis of anterior and posterior Pituitary hormone defects.
- Adrenal Cortex and Medulla
- Causes, aetiology, pathogenesis and lab. Diagnosis of adrenal cortical medullary hyper and hypo-function.
- List the aetiology and clinical features, types, diagnosis of different thyroid diseases
- Causes of solitary thyroid nodule and outline of clinical diagnostic approach.
- Etiology, pathogenesis, morphology and diagnosis of Thyroid tumors
- Types of MEN syndromes.
- Investigation, clinical features, aetiology of Parathyroid dysfunction
- Diabetes Mellitus: Type 1 and 2, pathogenesis, morphology, clinical features, laboratory diagnosis and complications.

SKIN

- Morphological and clinical features of different types of dermatitis
- Pathogenesis, morphological and clinical features of Bullous disease of the skin
- Types of warts and their most frequent locations.
- Predisposing factors for squamous cell carcinoma of skin.
- Etiology, pathogenesis, morphology, diagnosis and prognosis of squamous cell carcinoma and its differentiation from basal cell carcinoma.
- Different types of Nevi, with reference to clinical and morphological features, and diagnosis of malignant melanoma

NERVOUS SYSTEM

- Clinical and morphological features of intra-cranial hemorrhage.
- Acute and chronic meningitis including Tuberculous meningitis
- Brain abscesses, its clinical and morphological features and diagnosis
- Clinico-pathological features of Guillain-Barre syndrome.

- Types of intracranial tumors including common metastatic tumors to the brain

CHEMICAL PATHOLOGY

- Biochemical markers of ischemic heart disease
- Renal function tests.
- Causes of proteinuria and its laboratory diagnosis.
- Lab diagnosis of acid base disorders.
- Lab diagnosis of Diabetes mellitus.
- Liver function tests.
- Laboratory diagnosis of hyperlipidemia and its clinical interpretation.
- Role of enzymes in diagnosis of pancreatitis.
- Laboratory diagnosis/investigations of endocrine disorders: -
- Role of hormone estimation in diagnosis of infertility & growth disorders

COMMUNITY MEDICINE

Concept of Health and Disease

- Concept of health, Definition of health. Dimensions, physical, mental, social and spiritual. Spectrum of health, Determinants of health.
- Responsibility for health. Indicators of health. Health promotion.
- Concept of disease, concept of causation (all theories including ecological triad, agent, host and environmental factors), spectrum of disease. Natural history of disease. Levels of prevention. Disease elimination and eradication. Disease surveillance and disease prevention.

Introduction to Public Health

- Historical background
- Evolution of Public health
- Definition of Public health
- Branches of Public health
- Preventive medicine
- Social medicine
- Population medicine
- Community medicine
- International Health
- Health for all.

Health Systems in Pakistan

- Development of Public Health in Pakistan. Economics and Health.
- Health Policy and planning in Pakistan. “Health for all”, background, concepts and progress. “Primary Health Care”: Concepts and progress. The National Disease Control programmes; policies, strategies and operations.

- Health System in Pakistan: The role of Federal and Provincial Governments in Health Care. The District Health System, in the context of devolution. The Physician as a manager: Functions of manager, management of material, human and financial resources.
- Leadership and motivation.
- Partners in Health: The public and private sector. Non-governmental Organizations and International Agencies. Resources for health.
- Community Mobilization.

General Epidemiology and Research Methodology

- Background and concepts, uses, basic measurements in epidemiology (morbidity, mortality, disability and fatality).
- Epidemiological methods (descriptive, analytic and experimental).
- Epidemiological transition. Association and causation. Investigation of an outbreak or an epidemic. Screening for disease. Community diagnosis. Research and survey methodology. Introduction to qualitative research methodology.

Biostatistics

- Concepts and uses
- Data and its types
- Rates, ratios and proportions
- Crude, specific and standardized rates.
- Collection and registration of vital events in Pakistan
- Sources of health related statistics
- Measures of central tendency, (Mean, Median, Mode),
- Measures of dispersion (Range, Standard deviation, Standard error)
- Normal curve.
- Methods of data presentation (tables, graphs & diagrams)
- Interpretation of data (t-test and Chi-square test)
- Sampling and its various techniques.
- Health Management Information System

Demography and Population dynamics

- Concept, demographic principles and demographic processes
- Census, definition, methodology, types
- Determinants of fertility, mortality
- Population Pyramid, and its interpretation
- Demographic Transition, Demographic Trap and its public health importance
- Demographic and social implication of high population growth
- Social Mobilization
- Urbanization

Nutrition and Health

- Concepts (Nutrition, Nutrient, Food, Diet). Food groups and their functions. Role of fibre in diet. Balanced Diet

- Malnutrition at all stages of life, its types causes and prevention.
- Common nutritional problems of public health importance and their prevention and control
- Dietary requirements of normal human being at different stages of life
- Food hygiene, pasteurization, fortification, additives and adulteration and preservation
- Nutritional diseases and Programmes.
- Assessment of nutritional status of a Community

Reproductive and Child Health

- Safe motherhood and its components. (Ante-natal, Post-natal, Family Planning and Emergency Obstetric Care)
- Maternal mortality and its causes and prevention
- Infant care: Growth and development. Breast feeding, common causes of morbidity and mortality, their prevention and control
- Child Care: Child health surveillance. Health promotion strategies.
- Common ailments, home accidents, child mortality prevention.
- Strategic approaches of Integrated Management of Childhood Illness (IMCI)
- Adolescent health
- Reproductive tract infections: guidelines for management of sexually transmitted diseases

Health of school age children

- Role of teachers and role of doctor in the maintenance of health
- Procedures for determining the health status of school-age children
- Common health problems of school children

Environmental Health Sciences

- Air: Composition of air. Causes of Air pollution. Purification of Air.
- Diseases caused by impurities in the air and their prevention (Acute Respiratory Illnesses)
- Water: Sources of Water. Daily water requirement. Water pollution
- its causes and prevention. Purification of Water. Water quality standards. Diseases due to polluted water
- Waste disposal: Contents, hazards and safety measures for solid
- and liquid; Domestic, Industrial and Hospital waste (Global and Marine problems)
- Climate: Climate and weather. Global environmental concerns (Greenhouse effect, depletion of Ozone layer, Acid rains). Effect of extremes of temperature, humidity, atmospheric pressure on human health and their prevention
- Radiation: Sources, types, causes, hazards and prevention
- Healthful housing. Urban and rural slums. Refugee camps and hostels
- Noise: Definition, causes, acceptance level, hazards and control

Occupational Health

- Concepts, of occupational health, occupational medicine and

- occupational hygiene. Ergonomics and its importance
- Occupational hazards. Principles of control
- General principles of occupational disease prevention
- Organization of occupational health services
- Health Insurance and Social Security Schemes, Labour Laws

Prevention and control of Infectious diseases

Definitions to differentiate between

- Infection, contamination, pollution, infestation
- Infectious disease, communicable disease, contagious disease
- Host, Immune and susceptible persons
- Sporadic, Endemic, Epidemic, Pandemic
- Epizootic, Exotic, Zoonotic
- Contact, fomites, Carriers, Insect Vectors, Reservoir of infection
- Incubation period, Infective period, Generation time
- Cross infection, Nosocomial infection, Opportunistic infections, Iatrogenic (Physician induced) disorders
- Surveillance control, Eradication, Elimination

Dynamics of infections, disease transmission:

- Reservoir and source of infection
- Escape of organism
- Mode of transmission
- Entry into the body
- Susceptible host
- Immunity (different types of immunity and immunization).

Control of infection:

- Controlling the reservoir-notification, early diagnosis treatment,
- isolation, quarantine, disinfections.
- Interruption of transmission.
- The susceptible host (active and passive immunization, Combined.
- Chemoprophylaxis, Non-specific measures).
- Health advice to travellers.
- National case management guidelines.

Epidemiology, control and prevention of infectious diseases of Public Health importance.

- Diseases transmitted through inhalation.
- Diseases transmitted through faeco-oral route.
- Diseases of animals conveyed to man.
- Diseases due to direct contact.

Control and prevention of non-infectious diseases of Public Health importance

- Hypertension.
- Coronary heart disease.
- Cancers.
- Injuries.
- Diabetes mellitus.
- Obesity.
- Acute Rheumatic fever and heart diseases.

Arthropods and their public health importance

- Common arthropod-borne diseases
- Control of arthropods of medical importance
- Insecticides and their public health importance

Prevention and control of parasitic diseases of public health importance

- Common parasitic infections of Public Health importance.

Snake Bites: Identification, personal protection and management

Mental Health and Behavioural Sciences

- Concept. Common mental health problems, their causes, prevention and control
- Juvenile delinquency
- Drug abuse, addiction, alcoholism and smoking
- Child abuse and child labour
- Self-medication

Information, Education and Communication (IEC)

- Concept. Aims and objectives
- Approaches used in public health
- Contents, principles and stages of health education
- Communication methods, barriers and skills in health education
- Planning, organizing and evaluating a health education programme
- Social Marketing

Disaster and accidents

- Definition, Classification (Natural disasters like earthquake, floods.
- Epidemic of communicable diseases, Man Made Disasters. Thermo-nuclear warfare.
- Magnitude and effects of disaster and Public Health consequences.
- Disaster: preparedness and management.
- Accidents: Definition, classification, prevention.

Health Planning and Management

- Health Planning. Planning cycle,
- Management and administration.

- Management methods and techniques.
- Planning-programming-budgeting system

ENT

- **Ear** (Deafness, Vertigo Acute Suppurative Otitis Media and Chronic Suppurative Otitis Media, Otomycosis, vertigo-causes, investigations and initial management)
- Complication of Otitis media Secretory Otitis Media
- Hearing Loss, Presbycusis, noise induced hearing loss
- **Nose** (Rhinitis Trauma Nose, Nasal polyps, Sinusitis acute and chronic, Epistaxis), deviated nasal septum
- **Facial Paralysis**, Bell's Palsy, Ramsay –Hunt syndrome (diagnosis)
- **Throat** (Dysphagia, Infections Larynx and Pharynx, Hoarseness, Obstructed airway, Foreign bodies/Air Food Passage, Goitre)
- **Head and Neck tumours** (Acoustic Neuroma, Nasopharyngeal Fibroma, Ca Larynx, Thyroid cancers)

OPHTHALMOLOGY

- Cataract (Classification Senile cataract Congenital cataract, Complications of Cataract surgery)
- Glaucoma (Classification, Primary Open Angle Glaucoma)
- Acute Angle Closure Glaucoma, Management and Glaucoma Drugs)
- Retina (Diabetic Retinopathy Retinal Detachment)
- Age related macular Degeneration
- Ocular Trauma (Classification Emergency Management)
- Squint (Classification & Management)
- Refractive Errors
- Red Eye (Corneal Ulcer, Uveitis)
- Trauma to eye (diagnosis and initial management)
- Blindness (Etiology, investigations)
- Tumors (Retinoblastoma)



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