

**D. Y. PATIL EDUCATION SOCIETY DEEMED UNIVERSITY, KOLHAPUR**

**SECTION - B**

**CURRICULA I**

**1. PHASE-I (FIRST M.B.B.S.)**

**A) Introduction**

As per the Regulations on Graduate Medical Education, the M.B.B.S. course is divided into phases–I, II, and III. During phase -I every student shall undergo a period of study of pre-clinical subjects for two semesters.

These subjects are-

- 1-Human Anatomy
- 2-Physiology including Bio-Physics
- 3-Biochemistry
- 4-Introduction to Community Medicine

At the end of second term there will be I professional University examination.

**B) Time Distribution: -**

The first two semesters (approximately 240 teaching days) shall be occupied in the phase I (pre-clinical) subjects and introduction to a broader understanding of the perspectives of medical education leading to delivery of health care.

Following minimum teaching hours are prescribed in various disciplines for two semesters.

<b>Sr. No.</b>	<b>Name of The Subject</b>	<b>Number of Hours Allotted</b>
1	Human Anatomy	650
2	Human Physiology	480
3	Biochemistry	240
4	Community Medicine	060
	Total	1430

Didactic lectures should not exceed 1/3 of the time schedule, 2/3 schedule should include practical and group discussions/seminars/ tutorials. Learning processes should include living experiences and problem oriented approaches. Passing in phase –I is compulsory before proceeding to phase-II training.

**C) Attendance: -**

75% of attendance in a subject for appearing in the examination is compulsory provided he/she has 80% attendance in non-lecture teaching. I.e. seminars, group discussions, tutorials, demonstrations and practical's.

**D) Mode of Examination: -**

The University will conduct two Formative examinations in the form of Internal Assessment at departmental level and one Summative Examination at the end of completion of I phase.

**PATTERN OF INTERNAL ASSESMENT-**

Two Formative examinations in the form of Terminal examination at the end of I semester and Preliminary examination at the end of second semester.

**PATTERN FOR TERMINAL EXAMINATION-**

	<b>Theory Paper</b>	<b>Theory Viva</b>	<b>Total Theory</b>	<b>Practical's</b>
MARKS	60	20	80	60

**PATTERN FOR TERMINAL EXAMINATION-**

	<b>Theory Paper-I</b>	<b>Theory Paper-II</b>	<b>Theory Viva</b>	<b>Total Theory</b>	<b>Practical's</b>
MARKS	50	50	20	120	60

**CALCULATION OF INTERNAL ASSESMENT-**

<b>Sr.No.</b>	<b>Type of Examination</b>	<b>Marks Allotted</b>	
		<b>Theory</b>	<b>Practical</b>
1	TERMINAL	80	60
2	PRELIMINARY	100	60
	<b>TOTAL MARKS</b>	<b>180</b>	<b>120</b>
DIVIDED BY		20 to convert it to 10	12 to convert it to 10

Minimum 35 % in internal assessment in theory + practical i.e. (07 out of 20) to be eligible to appear for final examination.

**E. University examination: -**

There shall be one main university examination in a year at the end of second semester in the subjects of Anatomy, Physiology and Biochemistry.

Distribution of Marks: As per the following table

**APPENDIX – A**  
**FIRST M.B.B.S. EXAMINATION**  
**PAPER PATTERN FOR FINAL (UNIVERSITY EXAMINATION)**

THEORY	MARKS
PAPER –I	50
PAPER-II	50
THEORY VIVA	20
TOTAL THEORY	120
PRACTICAL	60
TOTAL MARKS	180

In each of the subjects a candidate must obtain 50% in aggregate with a minimum 50% in theory, 50% in Theory orals, 50% in practical and 50% in Internal Assessment.

The student must secure 50% marks in Internal Assessment also. However, even if the student secures minimum 35% marks, he/she will be allowed to appear for University Examination subject to compensating 15% marks more than minimum 50% in the concerned subject.

**NATURE OF THEORY PAPER (PAPER – I & PAPER – II) FOR  
I MBBS.**

Duration – 2 ½ hrs

Total Marks – 50

**SECTION - A**

Q. 1-MULTIPLE CHOICE QUESTIONS-10 (1 mark for each) 10 Marks  
(Based on whole syllabus)

**SECTION – B**

Q.2 -LONG ANSWER QUESTION (Any two out of three) 2x8=16 Marks  
(Based on topics from Must know group)

Q.3 - SHORT NOTES (Any Six out of Eight) 6x4=24 Marks  
(Based on topics from Must know and Desirable to know group)  
(This will include minimum TWO CASE STUDIES from the list given)

## MODEL TIME TABLE

### PHASE -I

(Subject to modification as per local situation)

#### First Semester

DAY	9-10 AM	10-11 AM	11-01 PM	1-2 PM	2-3 PM	3-5 PM
Mon.	Biochemistry	Anatomy	Phy./Bio (P/T)	Lunch	Physiology	Anatomy
Tues.	Anatomy	Biochemistry	Physiology	Lunch	Anatomy	Anatomy
Wed.	Physiology	Anatomy	Phy /Bio (P/T)	Lunch	Physiology	Anatomy
Thu.	Anatomy	Physiology	Phy /Bio (P/T)	Lunch	Anatomy	Anatomy
Fri.	Biochemistry	Anatomy	Phy /Bio (P/T)	Lunch	Physiology	Anatomy
Sat.	Biochemistry	Anatomy	Anatomy (P/T)	Lunch	Physiology	Community Medicine field work

#### Second Semester

DAY	9-10 AM	10-11 AM	11-01 PM	1-2 PM	2-3 PM	3-5 PM
Mon.	Biochemistry	Anatomy	Anatomy (P/T)	Lunch	Physiology	Phy /Bio (P/T)
Tue.	Anatomy	Biochemistry	Anatomy (P/T)	Lunch	Anatomy	Physiology
Wed.	Physiology	Anatomy	Anatomy (P/T)	Lunch	Physiology	Phy /Bio (P/T)
Thu.	Anatomy	Physiology	Anatomy (P/T)	Lunch	Anatomy	Phy /Bio (P/T)
Fri.	Biochemistry	Anatomy	Anatomy (P/T)	Lunch	Physiology	Phy /Bio (P/T)
Sat.	Biochemistry	Anatomy	Anatomy (P/T)	Lunch	Physiology	Community Medicine field work

Note: Community Medicine lectures are arranged in consolation with other preclinical departments in the above things.

## SUBJECTWISE SYLLABUS

### HUMAN ANATOMY

#### (I)Goal:

The broad goal of the teaching of undergraduate students in Anatomy aims at providing comprehensive knowledge of the gross and microscopic structure and development of human body to provide a basis for understanding the clinical correlation of organs or structures involved and the anatomical basis for the disease presentations.

#### (II)Objectives

##### A-Knowledge:

At the end of the course the student shall be able to

- (a) Comprehend the normal disposition, clinically relevant interrelationships, functional and cross-sectional anatomy of the various structures in the body
- (b) Identify the microscopic structure and correlate elementary ultra-structure of various organs and tissues and correlate the structure with the functions as a pre-requisite for Comprehend the basics of advanced teaching in anatomy as ENDOSCOPIC ANATOMY

##### B-Skills:

- (c) Understanding the altered state in various disease processes.
- (d) Comprehend the basic structure and connections of the central nervous system to analyse the integrative and regulative functions of the organs and systems. He/she shall be able to locate the site of gross lesions according to the deficits encountered.
- (e) Demonstrate knowledge of the basic principles and sequential development of the organs and systems; recognize the critical stages of development and the effects of common teratogens, genetic mutations and environmental hazards. He/she shall be able to explain the developmental basis of the major variations and abnormalities.

At the end of the course the student shall be able to;

- (a) Identify and locate all the structures of the body and mark the topography of the living anatomy.
- (b) Identify the organs and tissues under the microscope.
- (c) Understand the principles of karyotyping and identify the gross congenital anomalies.
- (d) Understand principles of newer imaging techniques and interpretation of CT scan sonogram etc.
- (e) Understand clinical basis of some common clinical procedures i.e. intramuscular and intravenous injection, lumbar puncture and kidney biopsy etc.

##### C-Integration:

From the integrated teaching of other basic sciences, student shall be able to comprehend and regulation and integration of the functions of the organs and systems in the body and thus interpret the anatomical basis of disease process.

**(III) Detail syllabus of Human Anatomy is given under following heads.**

- A) Introduction-
- B) General Anatomy
- C) Regional Anatomy
  - I - Upper limb
  - II - Lower limb
  - III - Abdomen
  - IV - Thorax
  - V - Head Face Neck
  - VI - Spinal Cord & Brain
- D) Micro-Anatomy
  - I - General Histology
  - II - Systemic Histology
- E) Developmental Anatomy
  - I - General Embryology
  - II - Systemic Embryology
- F) Genetics
- G) Radiological Anatomy, USG, CT, MRI
- H) Surface Anatomy, Living & Marking
- I) Sectional Anatomy
- J) Books recommended

## DETAIL SYLLABUS OF HUMAN ANATOMY

### A) INTRODUCTION-

Total lecture classes -----01
Topics to be covered- students must know-Significance of Anatomy in Medical Science, subdivisions of the subject. Anatomical position, Anatomical planes, commonly used terminologies used in Gross Anatomy, Histology, Embryology, For hollow organs, for solid organs, to indicate the side, for describing muscle, for describing movements of joints.

### B) GENERAL ANATOMY-

Total lectures hrs.—07 Total dissection hrs.—14 Total LCD hrs.—02 Topics to be covered			
Sr. No.	Name of The Topic	Must Know	Nicety Know
1	Integument /Skin and Fascia	<b>Skin</b> - Introduction, surface area, rule of nine, <b>Types</b> -thin, thick, hairy, functions, innervations. Applied anatomy <b>Structure</b> - Epidermis, dermis, glands. <b>Superficial fascia</b> -Distribution and functions. <b>Deep fascia</b> -features, modifications and functions.	Appendages –nails, hair. Skin grafting
2	General Myology	<b>Muscle tissue</b> -Definition, <b>Types</b> : Origin, Insertion, Morphological classification. Actions of muscles, nerve supply Functional classification, Prime movers, Fixators, Antagonists, Synergists. Applied anatomy. Synovial Bursa-Structure, functions and types.	Various classes of levers. Neuromuscular junction. Tendon synovial sheath.
3	General Angiology	<b>Blood Vascular System</b> - Types of circulation, types of arteries, Veins, Capillaries,Sinusoids,Anastomosis/	Haemorrhage, Arteriosclerosis.

		<p>Collateral circulation, End arteries, Vasa vasorum.</p> <p>Blood pressure.</p> <p>Lymphatic system- Mechanism of formation of lymph, functions, Lymph vessels, Central lymphoid tissue, Peripheral lymphoid organs, Circulating lymphocytes - T and B lymphocytes.</p> <p>Immunoglobulins.</p>	
4	General neurology	<p><b>Nervous Tissue</b>-Parts, Structure of nervous tissue,</p> <p>Neurons-Synapses and its types- structural and functional.</p> <p><b>Classification of neurons</b> -</p> <p>According to polarity and</p> <p>According to relative lengths of axons and dendrites. Degeneration and regeneration of neurons,</p> <p>Neuroglia.</p> <p>Nerves-Cranial – Spinal, Structure of typical spinal nerve</p> <p>Autonomic nervous system- Sympathetic-Sympathetic ganglia, postganglionic fibres</p> <p>Parasympathetic-Cranial outflow, Sacral outflow.</p>	Blood brain barrier, Reflex arc
5	General Osteology	<p><b>Bones</b>-Definition, functions, organic and inorganic components, various types of classification, gross structure of long bone, periosteum, parts of young bone, types of epiphysis, blood supply of long bones.</p> <p>Ossification- types, primary centre, secondary centre, laws of ossification, epiphysis plate.</p> <p>Fracture, rickets, scurvy.</p>	<p>Medicolegal and anthropological aspects.</p> <p>Bone marrow</p> <p>Osteoporosis,</p> <p>Osteomalacia,</p> <p>Osteodystrophy,</p> <p>Osteopenia,</p> <p>Osteomyelitis,</p> <p>Osteosarcoma,</p> <p>Bone marrow aspiration, bone grafting.</p>
6	General Arthrology	<b>Joints</b> -Definition, General features	Kinesiology



		<p>of joint, Types of classification- structural, functional and regional.</p> <p>Structural classification- fibrous, cartilaginous and synovial.</p> <p>Functional classification- synarthrosis, amphiarthrosis and diarthrosis.</p> <p>Regional classification- skull type, vertebral and limb type.</p> <p>Synovial joint- structure, axis of movement, classification of synovial joints- according to shape, axes of movement and morphology.</p> <p>Blood supply and nerve supply of the joints.</p> <p>Applied anatomy- dislocation, sprain.</p>	Arthritis, neuropathic joint.
7	Introduction to Osteology	<p><b>Definition</b></p> <p>Classification</p> <p>Terminology</p> <p>Functions</p> <p>Ossification</p>	Age determination

**DISSECTION- General Anatomy: Total Hours- 14**

Sr. No.	Topic	Hours
1	Introduction to Dissection- Skin and Fascia	4
2	Introduction to Dissection- Blood Vessels, Lymphatics and lymph nodes	4
3	Introduction to Dissection- Muscles, Bone and Joints	6

**C) GENERAL EMBRYOLOGY-**

Total Lectures – 16			
Sr. No.	Topic	Must Know	Nice to Know

1	Introduction	<p><b>Stages of Human Life</b></p> <p><b>Prenatal</b> – Zygote, Pre-embryonic, Embryonic, foetal, birth events</p> <p>Postnatal – Neonatal, infancy, childhood, prepubertal, pubertal, adolescent, adult – young, middle age, old age, death events</p> <p>Phylogeny, Ontogeny, Trimester, Viability, abortion, miscarriage, medical termination of pregnancy, conceptus, abortus</p> <p>Terms of reference: e.g. Cranial, Rostral, Caudal, Dorsal, Ventral, Lateral, Medial, Median, Planes of section.</p>	<p>The law of recapitulation, "Critical period", malformations, USG, Amniocentesis, Chorionic Villus Biopsy, Fetoscopy, etc.</p> <p>Teratology, Intrauterine surgery, History of Embryology</p>
2	Cell Division	<p>Types – Mitosis: stages, events occurring, end result, non-disjunction and anaphase lag</p> <p>Meiosis: stages, prophase I detailed, events occurring, end result, non-disjunction – aneuploidy, polyploidy, anaphase lag</p>	<p>Cell cycle, cyclines and cdk, tumour formation, Mosaicism</p>
3	<p>Gametogenesis:</p> <p>Spermatogenesis</p>	<p>Definition, Stages, Spermiogenesis, Normal sperm count, Azoospermia, Oligospermia, structure, function and viability of sperm, transport of sperms factors affecting spermatogenesis, Hormonal control of spermatogenesis, Capacitation of sperms</p>	<p>Sperm bank, Ovum bank, IUI (Intra Uterine Insemination), ICSI (Intra Cytoplasmic Sperm Injection), Teratogenic influences.</p>

4	Oogenesis	Definition, Stages, Ovarian cycle, - Definition, Stages ovarian follicles, Ovulation – Definition, Time, Hormonal control, Detection, Clinical significance, Structure, Function and viability of ovum, Factors affecting Oogenesis, Hormonal control of oogenesis, viability, Transport of ovum, Difference between spermatogenesis and oogenesis.	
5	Menstrual Cycle	Definition, Structure of endometrium, Phases – Menstrual, Proliferative, secretory, Hormonal control , correlation with ovarian cycle, ovarian cycle, Concept of first day of last menstrual period, Menarche, Menopause, Abnormalities of menstrual cycle.	Menorrhagia, Oligomenorrhoea, Polymenorrhoea,
6	Fertilization	Definition, events occurring, sperm capacitation, Normal site of fertilization, Acrosome reaction, Zona reaction, vitelline block, Effects of fertilization, Sex determination, methods of contraception, infertility, Assisted reproductive technology.	Pregnancy tests, pathogenesis, Surrogate motherhood; Social significance Of “Sex-ratio”, ethics and responsibility, cryopreservation of embryos.
7	Development in First Week	Cleavage – Definition, Type, Compaction, Morula, Blastocyst, Implantation – Definition, Normal site, Stages, Type, Decidua reaction, Normal site, Abnormal sites, Ectopic pregnancy, Placenta praevia.	“Abortion”; Chorionic Gonadotrophin – Pregnancy test, Inhibition of implantation.

8	Development in Second Week	<b>Epiblast, Hypoblast, Amnion, Chorion, Yolk sac,</b> Extraembryonic mesoderm and coelom, Cytotrophoblast, Syncytiotrophoblast, Fetal membranes, Chorionic villi, Bilaminar disc, Prochordal plate.	Mosaicism, Chimera.
9	Development in Third Week	<b>Gastrulation</b> , Primitive streak - formation and significance, Notochord – formation, functions, remnants, <b>Neurulation</b> - Neural tube and its fate, Neural crest cells - their fate, Development of somites, Intra-embryonic coelom, Allantois, Inductive significance of structures, congenital malformations – Sacrococcygeal Teratoma, neural tube defects, Spina bifida, Meningocele, anencephaly.	Signs of pregnancy in the first trimester, Role of teratogens, Alpha-fetoprotein levels.
10	Intraembryonic Mesoderm	Formation, Division – Paraxial mesoderm – somites formation, number of pairs, its division and fate, clinical significance, fate of intermediate and lateral plate mesoderm, germ layer derivatives.	Molecular regulation of somite Differentiation.
11	Fourth – Eight Week Development	<b>Folding of the embryo:</b> Head fold, tail fold, lateral folds, Orientation of structures before and after folding, changes occurring with folding, defects in folding – Ectopia cordis, Ectopia vesicae, Derivatives of germ layers, critical period of development.	Estimation of foetal age, ultrasound examination of foetus, Relative proportion of body segments, Details Of tissue differentiation and function, Factors influencing foetal growth.
12	Changes in	<b>Development of placenta,</b>	Placenta as an allograft,

	Trophoblast	Placental circulation, Placental membrane, Functions of placenta, Types of placentae	uterine growth during pregnancy, parturition
13	Fetal Membranes	<b>Chorion</b> – Formation, chorionic villi, Chorion frondosum and leave, Function, fate <b>Amnion</b> -formation, cavity, amniotic fluid formation, amount of fluid at term, Hydramnios, oligamnios, amniocentesis, functions, fate <b>Yolk sac</b> – formation, primary, secondary and tertiary yolk sac, fate, function, Allantois; Decidua; <b>Umbilical cord</b> – formation, length, contents, abnormalities	Rh incompatibility, Haemolytic disease of newborn, Chorion Villus biopsy, trophoblastic Tumour
14	Multiple Pregnancies and Teratogenesis	<b>Twins</b> – monozygotic, dizygotic <b>Teratogenesis</b> – enumeration of factors causing congenital malformations, concept of critical period.	Conjoint twins, Triplets, twin transfusions syndrome, superfecundation, superfetation.
15	Body Cavities, Primitive Mesenteries and Diaphragm	Coelomic cavity, Subdivisions, related parts i.e. cardiogenic area, Septum Transversum, Somatopleure, Splanchnopleure, Mesentery - formation, functions, fate, development of diaphragm	Diaphragmatic hernias, respiratory distress

#### D) GENERAL HISTOLOGY-

Total Lectures 11			
Sr.No.	Topic	Must Know	Nice to Know
1	Microscope	Light microscope: Parts, Magnification, Resolution.	Electron microscope, Micro techniques, H & E staining.
2	Cytology	<b>Cell, Cytoplasm and nucleus</b> , Cytomembranes, Unit membrane, Cell organelles. <b>Nucleus</b> - Structure, nuclear	Specialisations of cell surface, Sarcoplasmic reticulum of muscle, Endocytosis, Exocytosis,

		envelope, chromatin, nucleolus	movement of microvilli, Barr bodies
3	Epithelial Tissue	Definition, Classification, Structure of various types & Subtypes of epithelia. Surface modifications - Cilia; Microvilli; Stereocilia; Cell junctions and junctional complexes Glands- Classification; Unicellular and Multicellular; Exocrine, Endocrine, Paracrine. Apocrine, Merocrine, Holocrine; Exocrine: Simple, Compound; Tubular, alveolar, tubuloalveolar, Serous, Mucous, Mixed.	Nutrition, Renewal, Innervation, Metaplasia
4	Connective Tissue	Classification, Structure, Fibres, Ground Substance, Cells, Loose Areolar Tissue, Adipose Tissue.	Glycosaminoglycans, Synthesis of Collagenfibres
5	Cartilage	Hyaline (Costal) Section, Hyaline (Articular) Section, Fibrous Section, Elastic Section, Perichondrium, Functions	Growth: Interstitial, Appositional
6	Bone	Compact, Cancellous, bone; Ossification, Woven, Lamellar bone, Periosteum, Osteons, Volkmann's canals Developing bone LS	Endochondral Ossification, Intramembranous Ossification
7	Muscle Tissue	Skeletal muscle, Smooth, (Plain) muscle, Cardiac muscle Intercalate disc, Syncytium,, Sarcomere, I and A bands, Myofibrils, myofilaments, Actin, Myosin, Troponin, Tropomyosin, Sarcoplasmic Reticulum, "T" tubules, Triads.	Innervation, Motor end plate, Red fibres, White fibres, Regeneration
8	Nervous Tissue	Neurons, types,	Meissner's corpuscles,

		Neuroglia, types, Myelinated nerve fibre LS, Non-myelinated nerve fibre, Peripheral nerve T.S, Nodes of Ranvier	Pacinian corpuscle, Synapses
9	Blood Vessels	Classification, Large sized (Elastic)artery Medium sized(Muscular) artery, Arteriole; Capillary, Sinusoid, Medium sized vein TS	Diapedesis, Blood Brain Barrier, Thermoregulation
10	Lymphoid Tissue	T cells, B cells; Mucosa Associated Lymphoid Tissue (MALT) Humoral immunity, Cell mediated immunity, Lymph node section, Thymus section, Spleen section, Tonsil section	Blood-Thymus Barrier, Open and Closed Circulation in the Spleen
11	Integumentary System	Skin - Types; Epidermis and dermis; variouscells, Sebaceous& Sweat glands, Erector pili muscle, Appendages of skin.	Renewal of epidermis, Acne

#### D) SUPERIOR EXTREMITY-

<p>Total lectures hrs.--08  Total dissection hrs.—42  Total LCD hrs.--08  Topics to be covered.</p>			
Sr. No.	Name of The Topic	Must Know	Nice to Know
1	Introduction	Limb buds, dermatomes	
2	Mammary gland	Gross features, blood supply, lymphatic drainage, applied anatomy- mastitis, fibroadenoma, Paude-orange.	Mammography, fine needle biopsy, mastectomy

3	Axilla	<p>Definition, boundaries, contents, axillary artery, brachial plexus, axillary lymph nodes.</p> <p>Brachial plexus- formation, relations, branches, erb's paralysis, klumpke's paralysis, winging of scapula.</p>	<p>Axillary sheath, clavipectoral fascia.</p>
4	Nerves of upper limb	<p><b>Musculocutaneous nerve</b>- Root value, formation, course, relations, branches and applied anatomy.</p> <p><b>Axillary nerve</b>- Root value, formation, course, relations, branches, applied anatomy and Hilton's law.</p> <p><b>Median nerve</b>- Root value, formation, course, relations, branches, and applied anatomy- hand of benediction, pointing index, ape thumb and carpal tunnel syndrome.</p> <p><b>Radial nerve</b>-Root value, formation, course, branches, distribution and applied anatomy- lesion at axilla, arm. Posterior interosseous nerve. Wrist drop, Saturday night palsy.</p> <p><b>Ulnar nerve</b>-Root value, formation, course, relations, branches, distribution and applied anatomy-claw hand, ulnar paradox.</p> <p>Ulnar nerve in hand. Posterior interosseous nerve.</p>	<p>Intercostobrachial nerve.</p> <p>Cutaneous innervations of upper limb.</p> <p>Quadrilateral space syndrome.</p> <p>Median nerve entrapment.</p>
5	Joints of upper limb	<p><b>Shoulder girdle</b>-Bones contributing, joints involved, ligaments, movements and applied anatomy.</p> <p><b>Shoulder joint</b>- Classification, peculiarity, articulating surfaces, ligaments, factors stabilizing the joint, movements, applied</p>	<p>Mid-carpal joint, carpo-metacarpal joints, interphalangeal joint.</p> <p>Painful arc syndrome.</p> <p>Radio-ulnar bursitis.</p>



		<p>anatomy- dislocation, rotator cuff tendinitis, frozen shoulder. Analysis of abduction at shoulder joint.</p> <p><b>Elbow joint</b>- Classification, bones contributing and movements. Wrist joint- Bones contributing, classification, ligaments and movements.</p> <p><b>Radio-ulnar joints</b>- Superior, middle and inferior, pronation and supination, applied anatomy- pulled elbow, colles's fracture, smith fracture.</p> <p><b>Carpo-metacarpal joint of thumb</b>- Classification, bones contributing, ligaments, movements, applied anatomy-Bennett's fracture.</p>	
6	Arteries of upper limb	<p><b>Axillary Artery</b>- formation, parts, course, relations, branches, applied anatomy.</p> <p><b>Brachial Artery</b>- course, relation, branches, clinical anatomy,</p> <p><b>Radial Artery</b>- Origin, course, relation, branches, clinical anatomy.</p> <p><b>Ulnar Artery</b>- Origin, course, relation, branches, clinical anatomy.</p>	<p>Variations of division Volkmann's ischemic contracture Aberrant ulnar artery Superficial palmar arterial arch Deep palmar arterial arch-</p>
7	Arm	<p><b>Anterior compartment- Muscles</b>-Origin, Insertion, Nerve supply, Blood supply, Action Artery Nerves</p> <p><b>Cubital fossa</b>-boundaries, contents, applied anatomy</p> <p><b>Posterior compartment- Muscles</b>-- origin, insertion, nerve supply, blood supply, action Artery</p>	

		Nerves	
8	Forearm	<p><b>Front of forearm-</b> Muscles- Origin, Insertion, Nerve supply, Blood supply, Action Artery Nerves Relationship of structures on front of wrist</p> <p><b>Back of forearm-</b> Muscles- Origin, Insertion, Nerve supply, Blood supply, Action. Artery Nerves</p> <p><b>Extensor retinaculum-</b> Attachments, compartments, functions.</p>	
9	Hand	<p><b>Flexor retinaculum-</b> Attachments, relations Intrinsic muscles- lumbricals, interossei- nerve supply, action anatomical snuff box- boundaries, clinical importance Ulnar nerve in hand Fascial spaces of the hand, carpal tunnel syndrome first carpometacarpal joint</p>	<p>Dupuytren's contracture. Space of Parona</p>

10	Myology	<p><b>Muscles of arm and forearm and hand-</b> Attachments, nerve supply, action</p> <p>Biceps Brachii- Origin, Insertion, Nerve supply, Blood supply, Action</p> <p>Deltoid- Origin, Insertion, Nerve supply, Blood supply, Action</p> <p>Triceps brachii- origin, insertion, nerve supply, action</p> <p>Muscles of forearm -</p> <p>Muscles of hand- lumbricals, interossei- attachments, action, nerve supply</p> <p>Thenar muscles- - attachments, action, nerve supply</p> <p>Muscular spaces- Quadrangular and Triangular, contents, applied anatomy.</p>	<p>Volkman's ischemic contracture</p> <p>Triangle of Auscultation</p>
11	Demonstrations	<p><b>Identification,</b> Region, Anatomical position, Parts, Joints formed, attachment, ossification.</p> <p>Clavicle – Line of force transmission, commonest site of fracture.</p> <p>Scapula – Movements of scapula.</p> <p>Humerus – Neck of Humerus, Nerve related to Humerus, carrying angle</p> <p>Radius and Ulna– Pronation and supination.</p> <p>Carpals – Identification of individual carpals in an articulated hand, Carpal tunnel syndrome.</p>	<p>Weight transmission in upper limb</p> <p>Clavicle – Eight shape Bandage</p> <p>Scapula – Fracture scapula</p> <p>Humerus –</p> <p>Supracondylar spur, Angle of humeral torsion, Fracture</p> <p>Radius and Ulna– Colle’s fracture, smith’s fracture, Subluxation of head of radius</p> <p>Carpals, Metacarpals, Phalanges – Fracture scaphoid, Mallet finger, Bennett’s fracture, Trigger finger.</p>
12	Radiology	Principles of plain and contrast radiographs.	Estimation of age by radiographs.

		<p>Identification of gross anatomical features in plain and contrast radiographs.</p> <p>Diagnostic procedures, Technical details (e.g. dye).</p> <p>PLAIN X-RAY</p> <p>Shoulder region</p> <p>Arm</p> <p>Elbow region</p> <p>Fore arm</p> <p>Wrist and hand</p>	
13	Living Anatomy	<p><b>Bony Landmarks</b>-Palpation of: Clavicle, Spine of scapula, Inferior angle, Coracoid process, Head and styloid processes of radius and ulna, Heads of metacarpals (knuckles).</p> <p>Joints (demonstration of movements): Shoulder joint, Elbow joint, Radio-ulnar joints, Wrist joint, 1st carpo-metacarpal joint.</p> <p>Muscles (demonstration of action): Principle of testing: Trapezius, Serratus anterior, Pectoralis major, Deltoid, Biceps Brachii, Brachioradialis, Brachialis, Supinators.</p> <p>Nerves: Ulnar</p> <p>Vessels (Palpation of): Axillary artery, Brachial artery, Radial artery</p> <p>Others: Anatomical snuff-box (boundaries)</p>	<p>Bony landmarks (palpation of: Epicondyles of humerus, Olecranon process of ulna, Pisiform, Hook of Hamate</p> <p>Joints (demonstration of movements): Shoulder girdle, MP and IP joints</p> <p>Muscles (demonstration of action): Principle of testing: Latissimus dorsi, Extensors at the elbow, Supinators, Wrist extensors, Wrist flexors, Small muscles of the hand</p> <p>Nerves: Dermatomes</p> <p>Ulnar nerve thickening in Leprosy</p> <p>Others: Axillary groups of lymph nodes</p>

**DISSECTATION-- SUPERIOR EXTRIMITY: Total Hours- 42**

<b>Sr. No.</b>	<b>Topic</b>	<b>Hours</b>
1	Surface anatomy & bony landmarks of upper limb Mammary gland	6
2	Pectoral region	4
3	Axilla- Axillary artery, Brachial plexus	6
4	Back & scapular region	4
5	Anterior compartment of arm	2
6	Posterior compartment of arm	2
7	Shoulder joint	4
8	Cubital fossa	2
9	Forearm & hand	4
10	Extensor compartment of forearm	4
11	Dorsum of Hand	2
12	Part completion	2

**E) INFERIOR EXTREMITY-**

Total lectures hrs--09 Total dissection hrs—38 Total LCD hrs--07 Topics to be covered			
<b>Sr No</b>	<b>Name of The Topic</b>	<b>Must Know</b>	<b>Niceto Know</b>

1	Introduction	Venous and Lymphatic drainage, long and short saphenous veins Applied anatomy, Calf pump, Trendelenburg's test Varicose veins Deep fascia of thigh/fascia lata	Venous thrombosis
2	Femoral triangle	Boundaries, contents, Femoral sheath, Femoral canal, Applied anatomy, Femoral hernia	
3	Adductor canal	Boundaries, Contents, Applied anatomy	
4	Medial side of thigh	Muscles- Attachments, Nerve supply, Action	
5	Gluteal region	Boundaries, Muscles, Structures under cover of Gluteus maximus, applied anatomy, Intramuscular injections	Trochanteric, Cruciate anastomosis
6	Popliteal Fossa	Shape, Boundaries, Contents, Applied anatomy,	
7	Neurology	Nerves- Femoral, Sciatic, Obturator, Common Peroneal, Tibial Nerve Plexuses- Lumbar, Sacral, Femoral Nerve- Origin, Root value, Course, Branches, distribution, Applied Anatomy Sciatic Nerve- Origin, Root value, Course, Branches, Distribution, Applied Anatomy, Obturator- Origin, Root value, Course, Relation, Branches, Distribution, Applied anatomy, Nerve entrapment syndrome Common peroneal- - Origin, Root value, Course, Relation, Branches, Distribution, Applied Anatomy, foot drop	
8	Arteries of lower limb	<b>Femoral Artery</b> - Origin, Extent, Course, Relations, Branches, Applied Anatomy, used for ligation, passing a cannula or	Intermittent claudication, Clinical significance of anastomosis

		<p>catheter.</p> <p><b>Popliteal Artery</b>- Origin, Extent, Course, Relations, Branches, Applied Anatomy, Recording blood pressure</p> <p><b>Anterior Tibial Artery</b>-- Origin, Extent, Course, Termination, Relations, Applied Anatomy</p> <p><b>Posterior Tibial Artery</b>--- Origin, Extent, Course, Termination, Relations, Applied Anatomy</p> <p><b>Dorsalis Pedis Artery</b>- Origin, Extent, Course, Termination, Relations, Applied Anatomy, easily felt between tendons of extensor hallucis longus and first tendon of extensor digitorum longus.</p>	around Knee
9	Joints of lower limb	<p><b>Hip joint</b>, Knee joint, Ankle joint, Tibiofibular joints, Subtalar joint, Talocalcaneonavicular joint</p> <p><b>Hip joint</b>- Classification, Peculiarity, Articulating surfaces, Ligaments, Relations, Blood supply, Movements, Applied Anatomy- congenital dislocation, coxa vera, Perthes' disease, Osteoarthritis, fracture of neck of femur</p> <p><b>Knee joint</b>- Classification, Peculiarity, Articulating surfaces, Ligaments, Bursae around knee joint, Relations, Blood supply, Movements, Locking and unlocking, Applied Anatomy- Injuries to menisci and collateral ligaments, knee joint replacement</p> <p><b>Ankle joint</b>-Classification, Articulating surfaces, Ligaments, Relations, Blood supply, Movements, Applied Anatomy- sprains, Dislocation,</p>	Shenton's line Subtalar joint

10	Myology	<p><b>Muscles of front of thigh, back of thigh, medial side of thigh-</b> attachments, blood supply, nerve supply, action</p> <p><b>Muscles of front of leg-</b> attachments, blood supply, nerve supply, action</p> <p><b>Muscles of lateral side-</b> attachments, blood supply, nerve supply, action</p> <p>Inverters, Evertors of foot</p> <p>Muscles of medial side of leg and <b>Dorsum of foot-</b> attachments, blood supply, nerve supply, action</p> <p>Muscles of Back of leg- calf muscles, Tendoachillis Reflex</p> <p>Muscles of sole</p>	
11	Arches of foot	Classification, Formation, Factors responsible maintaining arches, Functions, Applied Anatomy	Pes cavus claw foot equinovarus
12	Demonstrations	<p>Identification, region, anatomical position; parts, joints formed, ossification.</p> <p><b>Femur</b> – Blood supply of head of femur, Neck shaft angle, Fracture neck Femur.</p> <p><b>Tarsals</b> - identification of individual tarsals in an articulated foot.</p> <p><b>Calcaneus</b> – Calcaneal spur</p>	Applied aspects: walking and transmission of weight, Angle of femoral Torsion, bone grafts.
13	Radiology	<p><b>Principles of plain and contrast radiographs.</b></p> <p>Identification of gross anatomical features in plain and contrast radiographs.</p> <p>Diagnostic procedures, Technical details (e.g. dye).</p> <p>Hip region</p> <p>Knee region</p> <p>Leg</p> <p>Ankle region</p>	



		Foot	
14	Living Anatomy	<p><b>Bony Landmarks</b> -Palpation of: Anterior superior iliac spine, Iliac crest, Adductor tubercle, Head and neck of fibula, Lateral and medial malleoli, Tibial tuberosity, Subcutaneous surface of tibia.</p> <p>Joints (demonstration of movements): Hip,Knee,Ankle, Subtalar Joints</p> <p>Muscles (demonstration of action): Hip-Flexors, Extensors, Abductors, adductors Knee: Flexors, Extensors, Ankle: Dorsiflexors, Plantar flexors Subtalar: Invertors, Evertors</p> <p>Nerves: Tibial, Common peroneal, Femoral</p> <p>Vessels(palpation of): Femoral, Popliteal, Dorsalis pedis, Posterior tibial</p> <p>Tendons: Semitendinosus, Semimembranosus, Biceps femoris, Iliotibial tract</p>	<p>Bony landmarks - palpation of: Tubercle of the iliac crest, Ischial tuberosity, Greater trochanter, Patella</p> <p>Nerves: Dermatomes, Sciatic, Common peroneal, Obturator</p> <p>Thickening of common peroneal nerve in Leprosy</p> <p>Others: Ligamentum patellae, Inguinal lymph nodes</p> <p>Tendons:</p>

**DISSECTION-- INFERIOR EXTREMITY: Total Hours- 38**

Sr. No.	Topic	Hours
1	Lower Limb- Surface Landmarks and Incision for dissection	2
2	Superficial fascia and Great Saphenous Vein	2
3	Anterior compartment of Thigh- Femoral Triangle	2
4	Muscles of Anterior compartment of Thigh and Femoral Nerve	2
5	Medial compartment of Thigh –Muscles and obturator nerve, Adductor canal	2
6	Gluteal Region- Surface Landmarks and superficial & deep fascia, Gluteus maximus muscle, Tensor fascia lata	2
7	Structure under gluteus maximus muscle	4

8	Popliteal fossa	4
9	Posterior compartment of thigh	2
10	Hip joint	4
11	Anterior and lateral compartment of leg	4
12	Posterior compartment of leg	2
13	Sole of foot	2
14	Knee Joint	2
15	Part completion	2

#### F) ABDOMENAND PELVIS

<p>Total lectures hrs--20  Total dissection hrs—84  Total LCD hrs--10  Topics to be covered</p>			
Sr. No.	Name of The Topic	Must Know	Niceto Know
1	Anterior abdominal wall	Umbilicus, inguinal ligament, inguinal canal, rectus sheath, spermatic cord, testes with its covering, surgical incisions of abdomen Quadrants and regions of anterior abdominal wall	Types of Inguinal Hernia,
2	Spermatic cord	Beginning. end, course, contents, coverings, applied anatomy, vasectomy	
3	Testes	External features, coverings, structure, blood supply, venous drainage, nerve supply	
4	Peritoneum	Lesser omentum, omental bursa, epiploic foramen, peritoneal folds, Hepatorenal pouch, pouch of Douglas	Peritoneal fossae laparoscopy laparotomy internal hernia
5	Abdominal organs	Morphology, Relations, Blood supply, Lymphatics, Nerve supply, Applied Anatomy of following organs- Stomach Spleen Liver	Peptic ulcer Splenic circulation Splenic vascular segments Liver biopsy Duct system of Pancreas Hydronephrosis

		Biliary apparatus Pancreas Small Intestine Large intestine and vermiform appendix Kidneys, Ureters, Urinary Bladder- Mechanism of micturition Suprarenal glands. <b>Endoscopic</b> laparoscopy,Gastroscopy, Colonoscopy, ERC-Endo retrograde Cysto cholangiography	Pheochromocytoma surgical approach to Kidney stones Gastroscopy Achlorhydria Splenectomy Liver transplant Renal transplant Cushing' disease Stones in ureter.
6	Pelvic organs	Morphology, Relations, Blood supply, Lymphatics, Nerve supply, Applied Anatomy of following organs- Urinary Bladder and Urethra- Supports of bladder, Mechanism of micturition, Stones in bladder Uterus Ovaries and Uterine tubes- ovarian cyst, enlargement, complications Prostate and male urethra. Rectum and Anal canal- supports of rectum. <b>Endoscopy-</b> Cystoscopy,Ureteroscopy	Cystoscopy Hysterectomy, Cancer, Fistula, Fissures, Piles
7	Perineum	Ischiorectal fossa, Pudendal canal, Perianal spaces, Urogenital diaphragm, Male urethra, penis, Perianal pouches	Ischiorectal hernia
8	Myology	Muscles of anterior abdominal wall-- External oblique- Internal oblique-	Psoas abscess Congenital hernia

		<p>Rectus abdominis-  Transverse abdominis-  (Origin, Insertion, Nerve supply  Actions)  Psoas major--  Quadratus lumborum--  Thoracoabdominal diaphragm-  Origin, Insertion, Large and  Small openings, Relations, Nerve  supply, Action, Development  Thoracolumbar fascia  Perineal spaces and muscles</p>	
10	Demonstrations	<p>Identification, Anatomical  position; Parts, Joints formed,  Description, Attachments,  relation, Ossification.  Bony Pelvis –Types,  Anthropometry, Difference  between male and Female  pelvis.</p>	<p>Anatomical basis of disc  prolapses, nerve  compression,  Sacralization,  Lumbarisation.</p>
11	Radiology	<p>Principles of plain and contrast  radiographs.  Identification of gross  anatomical features in plain and  contrast radiographs.  Diagnostic procedures,  Technical details (e.g. dye).  Plain X-ray.  Barium meal  Barium meal follow through  Barium enema.  Intravenous urogram  Hystero-salpingogram.</p>	<p>Oral cholecystogram</p>
12	Living Anatomy	<p><b>Bony Landmarks</b> (Palpation of)  Anterior superior iliac spine,  Pubic tubercle  Joints (demonstration of  movements):  Intervertebral  Muscles (demonstration of  action):</p>	

		Obliques, Transversus abdominis, Rectus abdominis Nerves: Dermatomes Others: Enlarged liver, spleen, kidneys, abdominal quadrants and regions; Position of superficial and deep inguinal rings; renal angle; McBurney's point.	
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**DISSECTION -- ABDOMEN & PELVIS: Total Hours- 84**

Sr. No.	TOPIC	Hours
1	Anterior Abdominal Wall- Muscles, Rectus Sheath & Inguinal Canal	8
2	Male External Genitalia	6
3	Abdominal Cavity & Peritoneum	6
4	Stomach	4
5	Coeliac Trunk	4
6	Spleen	4
7	Duodenum	4
8	Pancreas	2
9	Portal Vein	2
10	Small Intestines	4
11	Large Intestines – Caecum & V. Appendix	4
12	Liver & Gall Bladder	4
13	Kidney, Ureter	4
14	Supra Renal Gland	2
15	Post wall of abdomen	4
16	Perineum & Perineal Pouches /Ischio rectal fossa, Pudendal canal	6
17	Urinary Bladder, Prostate, Urethra	6
18	Rectum & Anal Canal	4
19	Uterus, Vagina, Ovary, Broad ligament	4
20	Part Completion	2

**G) THORAX**

Total lectures hrs--08 Total dissection hrs—40 Total LCD hrs--06 Topics to be covered			
Sr. No.	Name of The Topic	Must Know	Nice to Know
1	Thoracic inlet	Boundaries, Partition at inlet, structures passing through inlet,	
2	Thoracic outlet	Boundaries, Diaphragm at outlet, Structures passing through Diaphragm, major openings and their levels, Minor openings in outlet, Importance of minor openings	
3	Thoracic wall	Typical intercostals space, boundaries and contents Intercostal muscles-extent, direction of fibres, nerve supply, blood supply, action Respiratory movements- Principles of movements, factors producing increase in diameter of thorax, respiratory muscles, bucket handle and pump handle movements	Pigeon chest
4	Pleura	Pulmonary and parietal pleura Pulmonary ligament Recesses of pleura Nerve supply, blood supply, lymphatic drainage of pleura Applied anatomy	Pleurisy Pneumothorax Pleural effusion Importance of recesses
5	Lungs	Features Fissures and lobes Root of lung- arrangement of structures in the root Relations at the root Broncho-pulmonary segments- applied anatomy	Segmental resection
6	Mediastinum	Boundaries, Divisions, Contents Middle, Superior and Posterior	Mediastinitis, Mediastinoscopy

		mediastina Boundaries, Contents, Applied Anatomy	Mediastinal syndrome Coarctation of Aorta, Aneurysm
7	Pericardium	Fibrous and serous pericardium Contents, Sinuses Blood supply, Nerve supply	Referred pain, Pericardial effusion
8	Heart	Anatomical position, Location, surfaces and borders, Interior of all chambers, conducting system of Heart, Vessels of heart Right atrium, Left ventricle Blood supply of Heart Applied anatomy- heart sounds, cardiac pain, tachycardia, Palpitation, aortic incompetence, coronary angiography, angioplasty	Fallot's' Tetralogy Patent Ductus arteriosus
9	Oesophagus	Curvatures, constrictions, Relations, blood supply	
10	Thoracic duct	Course, Relation, Tributaries, Applied Anatomy, Variations	
11	Osteology	Identification and parts of vertebrae, ribs and sternum Identification of T1, T9, T10, T11, T12, vertebrae and atypical ribs – 1, 2, 11, 12. Relations, Attachments, Ossification. Movements of ribs.	Fracture ribs, flail chest, compression fracture of vertebra, sternum puncture.
12	Radiology	Principles of plain and contrast radiographs. Identification of gross anatomical features in plain and contrast radiographs. Diagnostic procedures, Technical details (e.g. dye). X-ray Chest, Barium swallow	
13	Living Anatomy	<b>Bony Landmarks</b> -Palpation of: Sternal angle, counting of rib	

		spaces, Joints (demonstration of movements): Intervertebral Muscles (demonstration of action): respiratory movements Others: Apex beat	
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**DISSECTION--THORAX: Total Hours – 40**

Sr. No.	Topic	Hours
1	Thoracic Wall – Intercostal Spaces	4
2	Thoracic Cavity – Mediastinum	6
3	Pleura	2
4	Lung	6
5	Pericardium	4
6	Heart	8
7	Post. Mediastinum	8
8	Part Completion	2

**H) HEAD, NECK AND FACE**

Total lectures hrs--16 Total dissection hrs—116 Total LCD hrs--14 Topics to be covered			
Sr. No.	Name of The Topic	Must Know	Nice to Know
1	Deep cervical fascia	Layers of deep fascia, attachments, Carotid sheath- relations, contents Ansa cervicalis.	
2	Triangles of neck	Anterior Triangle- boundaries, sub-division, contents, Digastric Triangle- boundaries, contents	Surgical neck incision,



		<p>Carotid Triangle- - boundaries, contents, common carotid artery, carotid sinus, external carotid artery and its branches</p> <p>Muscular triangle- - boundaries, contents, infra hyoid muscles.</p>	
3	Glands	<p><b>Thyroid gland</b>- Situation and extent, Dimensions, Capsules, Blood supply, Venous and lymphatic drainage, Nerve supply, Applied Anatomy</p> <p><b>Parathyroid Gland</b>- Position, blood supply, Nerve supply</p> <p><b>Parotid Gland</b>- External features, Capsules, Relations, Parotid duct, Blood supply, Nerve supply, Lymphatic drainage, Applied Anatomy</p> <p><b>Submandibular gland</b>- Features, Superficial and deep part, Wharton's duct, Blood supply, Lymphatic drainage, Nerve supply</p> <p><b>Sublingual salivary gland</b>- Relations</p> <p>Submandibular ganglion</p> <p>Pituitary gland- Introduction, Relation, Sub division, Blood supply, Lymphatic drainage, Nerve supply, Hormones, Applied Anatomy.</p>	
4	Scalp	<p>Extent, structure, Blood supply, Venous and Lymphatic drainage, Nerve supply, Applied Anatomy, Dangerous area of face.</p>	Cephalhematoma
5	Palate	<p>Hard palate</p> <p>Soft palate- Structure, Muscles, Nerve supply, Blood supply, Movements and functions, Development, Applied Anatomy, Cleft palate.</p>	

6	Tongue	External features, Papillae of tongue, Muscles of tongue, Blood supply, Venous and lymphatic drainage, Nerve supply, Motor and Sensory nerve supply, Applied Anatomy.	
7	Larynx	Situation and extent, Size, constitution of larynx, Cartilages of larynx, Paired and unpaired cartilages, Laryngeal joints, Cavity of larynx, Intrinsic muscles of larynx, Nerve supply, action of muscles, Movements of vocal folds, Blood supply and venous drainage, Mechanism of speech	Laryngoscopy Tracheostomy Laryngectomy
8	Pharynx	Dimensions, Boundaries, Parts, Structure, Muscles <b>Waldeyer's lymphatic ring,</b> <b>Palatine tonsil-</b> Blood supply, Venous and Lymphatic drainage, Nerve supply, Applied Anatomy Deglutition- stages <b>Auditory tube-</b> Bony and cartilaginous part, Relation, Blood supply, Venous drainage, Nerve supply, Function, Applied Anatomy	Killian's dehiscence Eustachian catarrh
9	Orbit	Features, Contents, Visual axis, Extraocular muscles, Voluntary and involuntary, Vessels of orbit, Ophthalmic veins, Nerves of orbit, Ciliary ganglion	
10	Eye ball	Cornea, Ciliary body, Lens, Cataract	Graft, transplantation
11	Styloid apparatus	Structures attached to styloid process	
12	Nasal cavity	Nasal septum- Bony and cartilaginous part, Blood supply,	

		<p>Venous drainage, Lymphatic drainage, Nerve supply</p> <p>Lateral wall of Nose- Conchae and meatuses, Features, openings in meatuses, Blood supply, Venous drainage, Lymphatic drainage, Nerve supply</p> <p>Paranasal Sinuses- Frontal and maxillary sinus, Openings, Applied Anatomy, Sinusitis</p> <p>Pterygopalatine fossa- Boundaries, Communication, contents</p>	
13	Ear	<p>Tympanic Membrane- Surfaces, layers, Blood supply, Venous drainage, Lymphatic drainage, Nerve supply, Applied Anatomy</p> <p>Middle Ear- shape, size, parts, communication, contents, boundaries, ear ossicles, muscles of middle ear, functions, blood supply, venous drainage, lymphatic drainage, nerve supply, applied anatomy, otitis media</p> <p>Mastoid Antrum- Boundaries, Mastoid air cells, Blood supply, Venous drainage, Lymphatic drainage, Nerve supply, Applied Anatomy, Mastoid Abscess</p>	<p>Inner ear- bony and membranous labyrinth, semi-circular ducts, blood supply of labyrinth, vestibulocochlear nerve</p>
14	Meninges	<p>Dura mater-outer</p> <p>Arachnoid mater- middle</p> <p>Pia mater- inner</p> <p>Layers of dura mater- Endosteal and Meningeal</p> <p>Falx cerebri, Falx cerebella, Diaphragma sellae, Tentorium cerebella</p>	
15	Joints	<b>Temporomandibular joint-</b>	

		Type, articular surfaces, ligaments, articular disc, relations, blood supply, nerve supply, movements, muscles producing movements, applied anatomy, dislocation	
16	Myology	Sternomastoid - origin, insertion, nerve supply, action Digastric- Mylohyoid Hyoglossus Muscles of facial expression- facial nerve palsy Muscles of Mastication Muscles of larynx Muscles of Pharynx Muscles of Tongue Muscles of Palate Extra ocular muscles	
17	Angiology	Subclavian Artery- Origin, Parts, Course, Relations, Branches Internal carotid External carotid Vertebral Lingual Facial Maxillary	
18	Venous sinuses	Emissary veins Cavernous sinus- Relations, Tributaries, Draining channels Superior sagittal sinus- Tributaries Inferior sagittal sinus	
19	Veins	External jugular vein- Course, Relations, Tributaries, Internal Jugular Vein-- Course, Relations, Tributaries, Venous Drainage of Face- Facial vein, Deep facial vein, Dangerous area of face	

20	Neurology	Facial nerve- Functional components, Nuclei, Course and relation, Branches and distribution, Applied Anatomy Maxillary Nerve- Trunk, Division, Relation, Applied Anatomy Mandibular Nerve- Course and relation, Branches and distribution, Applied Anatomy	
21	Osteology	Identification, Anatomical position, Parts, Foramina in the skull, Structures passing through them, Norma basalis, Verticalis, frontalis, Lateralise, Occipitalis and interior of cranial cavity Foetal skull: Fontanelles, Mandible: Age changes.	Dental formula, Fractures of the skull, Age of dentition, Cervical rib, Disc Herniation.
22	Radiology	Principles of plain and contrast radiographs. Identification of gross anatomical features in plain and contrast radiographs. Diagnostic procedures, Technical details (e.g. dye). X-ray skull plain Plain X-ray cervical region	Water's view
23	Living Anatomy	<b>Bony landmarks</b> (Palpation of): Nasion, Glabella, Mastoid process, Suprameatal Triangle, Zygomatic arch, Angle of mandible, Head of Mandible, Joints (Demonstration of movements): <b>Temporomandibular joint</b> , Atlanto-occipital joint Muscles (Demonstration of action): Of mastication, of facial expression, sternocleidomastoid <b>Nerves:</b> <b>Cranial nerves</b> (I to XII) testing	<b>Bony landmarks</b> (palpation of): Inion, Zygoma. Joints (demonstration of movements): Cervical joints Muscles (demonstration of action) neck flexors and extensors Others: Cervical lymph nodes.

		<p>Vessels (Palpation of):          Superficial Temporal Artery,          Facial Artery, Common Carotid          Artery, External Carotid Artery</p> <p>Others:          Symphysis Menti, Hyoid bone,          Thyroid cartilage, Cricoid          cartilage, Tracheal rings,          Suprasternal notch, Transverse          process of atlas, Spine of          c7,thyroid gland</p>	
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**DISSECTION-- HEAD, NECK, FACE: Total Hours-116**

<b>Sr. No.</b>	<b>Topic</b>	<b>Hours</b>
1	Introduction to skull	2
2	Scalp	2
3	Facial Muscles	4
4	Deep Cervical Fascia	6
5	Triangles of Neck	6
6	Posterior Triangle of Neck	4
7	Anterior Triangle of Neck	8
8	Deep Dissection of Neck - Thyroid Gland	6
9	Suboccipital Triangle	4
10	Removal of Brain from Cranial Cavity	6
11	Lacrimal Apparatus	2
12	Orbit & Extraocular Muscles and Ciliary ganglion	6
13	Parotid Region	6
14	Submandibular Region	6
15	Temporal & Infratemporal Region	8
16	TM Joint	4
17	Pharynx, Soft palate & Tonsil	6
18	Nasal Cavity & Paranasal Air Sinuses	6
19	Tongue	4
20	Larynx	8
21	Cranial Meninges & Dural Sinuses	6
22	Ear	4
23	Part Completion	2

## I) CENTRAL NERVOUS SYSTEM

Total lecture hrs.--09 Total dissection hrs.—50 Total LCD hrs.--06 Topics to be covered			
Sr. No.	Name of The Topic	Must Know	Nice to Know
1	Spinal cord	<b>Features</b> , Meningeal coverings, enlargements, Cauda equina, internal structure, Spinal nerves, spinal segments, Nuclei, Tracts, Descending and Ascending tracts, Blood supply, Applied anatomy	
2	Spinal cord tracts	<b>Descending tracts</b> - Pyramidal, or corticospinal, Extrapyramidal tracts, <b>Ascending tracts</b> - Lateral, spinothalamic tract	
3	Brain stem	<b>Introduction</b> , parts Medulla oblongata- External features, Internal structure, Applied Anatomy <b>Pons</b> - External features, Internal structure, Applied Anatomy <b>Midbrain</b> - Sub divisions, Internal structure, Clinical anatomy Development of Brain stem	
4	Cranial nerve nuclei	<b>Functional component</b> General somatic efferent nuclei Special Visceral efferent nuclei General Visceral efferent nuclei General Visceral afferent nuclei Special Visceral afferent nuclei	
5	Medulla oblongata	Transverse section through lower part passing through pyramidal decussation	
6	Pons	Section at level of facial colliculus TS of upper pons	

7	Midbrain	Section at the level of superior and inferior colliculi	
8	Cerebellum	Location, External features, parts, Morphological and functional division, Connections, Grey matter, Nuclei, Blood supply, Functions, Applied Anatomy	
9	Cerebrum	Introduction, Features, External features, Sulci and Gyri, Functional areas, Motor and Sensory areas, Applied Anatomy	
10	Thalamus and Basal ganglia	Structure and nuclei, Connections and functions, Applied Anatomy, Basal Ganglia- Features, Corpus striatum, Caudate nucleus, lentiform nucleus	

**DISSECTION-- CENTRAL NERVOUS SYSTEM: Total Hours -50**

Sr. No.	Topic	Hours
1	Spinal Cord	4
2	Brain Stem	6
3	4 <sup>th</sup> Ventricle	4
4	Cerebrum – External features	6
5	Cerebrum – Functional Areas	2
6	Cerebellum	6
7	3 <sup>rd</sup> Ventricle & Lateral ventricle	6
8	Internal capsule & white mater of Cerebrum	4
9	Thalamus & Basal Ganglia	4
10	Sections of Brain	6
11	Part Completion	2

**I) SYSTEMIC EMBRYOLOGY**

Total No. Of Lectures -21
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Sr. No.	Topic	Must Know	Nice to Know
1	Respiratory System	<b>Development</b> of larynx, trachea, bronchi, lungs, tracheo-oesophageal fistula	Respiratory distress syndrome, premature birth, other anomalies
2	Cardiovascular System	<p>Cardiogenic area</p> <p>Endothelial heart tubes - parts, folding, walls, external appearance, sinus venosus, chambers of heart, internal septation, Interatrial septum, interventricular septum, truncus – formation and fate, spiral septum, fate of each part of heart tube, pericardium, pericardial sinuses, septum transversum, aortic arches – fate, congenital anomalies, foetal circulation – path, shunts, changes after birth</p> <p>Congenital anomalies of heart – ASD, VSD, Fallot's tetralogy, PDA, Anomalies of arch of aorta</p>	Development of Major veins, anomalies of lymphatic system, clinical features of anomalies, prosthetic valves, grafting, transplantation, surgical correction
3	G.I.T.	<p>Gut tube – derived from, parts, mesentery</p> <p><b>FOREGUT</b> – derivatives – post laryngeal part oesophagus, stomach, duodenum, , artery, development of liver, pancreas and gall bladder, congenital anomalies</p> <p>Development of spleen and congenital anomalies</p> <p><b>MIDGUT</b> – derivatives, artery, rotation and fixation, physiological herniation, effects of rotation, errors of rotation, Vitello-Intestinal Duct, Omphalocele, Meckel's</p>	Hirschsprung's disease, situs invertus, lesser sac

		diverticulum, caecum and appendix, congenital anomalies, <b>HIND GUT</b> -derivatives, artery, congenital anomalies, cloaca, anal canal	
4	Urinary System	<b>Development of Kidneys</b> – pronephros, mesonephros, metanephros, ascent of kidney, rotation, blood supply, congenital anomalies ureter – ureteric bud, derivatives, congenital anomalies, cloaca – urinary bladder, urachus, urethra, Pronephric and mesonephric ducts, congenital anomalies	Details of development of male urethra, female urethra
5	Male Reproductive System	<b>Development of Testis</b> – gonadal ridge, processus vaginalis, descent of testis, anomalies in descent, mesonephric duct's derivatives and remnants, development of seminal vesicle and prostate glands	External genitalia, ambiguous genitalia and hermaphroditism
6	Female Reproductive System	Development of ovary, uterus, fallopian tubes, cervix, vagina, Paramesonephric duct – derivatives and remnants	External genitalia, ambiguous genitalia and hermaphroditism
7	Pharyngeal Arches and Face	<b>Ectodermal clefts</b> - cervical sinus, auricle <b>Mesodermal derivatives</b> – skeletal, muscle mass, arterial arches, pretrematic and post trematic nerves <b>Endodermal pouches</b> – tubo – tympanic recess, tonsil, thymus, parathyroid, thyroid <b>Derivatives from floor of pharynx</b> – Tongue and its	Other congenital anomalies of face, oblique facial cleft, Treacher Collin's syndrome

		<p>correlation with nerve supply, congenital anomalies</p> <p><b>Thyroid</b> – development and congenital anomalies</p> <p><b>Development of palate</b> – primitive palate, secondary palate, cleft palate</p> <p><b>Development of face</b> – Mandibular process, maxillary process, frontonasal process, cleft lip</p>	
8	Nervous System	<p><b>Neural tube</b>– derived from, flexures, parts, derivatives - spinal cord and brain i.e. Fore brain, mid brain, hind brain, ventricles, Histogenesis, functional classification of nuclear groups</p> <p><b>Congenital anomalies</b> – anencephaly, Spina bifida, Meningocele, Meningomyelocele, hydrocephalus</p> <p><b>Neural crest cell</b> - derivatives</p>	Sequence of myelination of tracts, relative shortening of spinal cord vis-à-vis vertebral column, genetic and teratologic factors in neural tube defects
9	Development Of Eye Ball	<p><b>General organization</b>, development of lens and anomalies, retina, cornea, optic nerve, detachment of retina</p>	Development of choroid, eye lid, conjunctiva, lacrimal gland, coloboma of iris, congenital glaucoma, Cyclops
10	Development of Ear	External Ear, middle ear	Internal ear
11	Endocrine Glands	<p><b>Development of pituitary</b>– Rathke's pouch, neural tube extension, Craniopharyngioma</p> <p><b>Development of Suprarenal</b> - cortex from intermediate mesoderm, medulla from neural crest cells, foetal cortex, its fate, definitive</p>	Histogenesis

		cortex, congenital anomalies <b>Thyroid and parathyroid –</b> thyroglossal duct, it's course, derivatives, congenital anomalies, pharyngeal pouches, caudal pharyngeal complex	
12	Muscular System	Myotomes, local differentiation, myotonic fusion, splits and migration, correlation with motor innervation, common anomalies and anatomic variations	Rare syndromes of muscular defects and genetic deficiencies
13	The Limbs	General Principles, Rotations –dermatome distribution	Congenital malformations, Teratogenic influences
14	Integumentary System	Development of epidermis, dermis, epidermal ridges, sweat gland, sebaceous gland, mammary gland	Histogenesis, congenital anomalies, development of tooth, hair, nails

#### J) SYSTEMIC HISTOLOGY

Total No. Of Lectures -15			
Sr.No.	Topic	Must Know	Nice to Know
1.	<b>Respiratory System</b>	Olfactory mucosa; Epiglottis; Trachea, Lung, Bronchus, bronchiole, alveolar duct, sac, alveoli, pulmonary type I and II cells	Air Blood Barrier, Double spirally arranged bronchial smooth muscle.
	<b>Alimentary System</b>		
2	Oral Tissues	Lip, Tongue, Taste buds, Papillae; Salivary glands	Tooth, Developing tooth, Striated duct, Ion transport
3	GI Tract	Basic organization - 4 layers, Oesophagus with glands, Stomach – Fundus: Chief cells, Parietal cells, intrinsic factor; Stomach Pylorus: Duodenum Brunner's glands, Small intestine - with Peyer's patch, Appendix, Large intestine.	Pernicious anaemia, Ulcer, Gastritis, Hirschsprung's disease or Megacolon

4	Accessory Digestive Glands	Pancreas: Exocrine, islets of Langerhans, acinar cells, Centro acinar cells; Liver: Hepatic lobule, portal lobule; portal acinus; Gall bladder	Liver as an endocrine gland, Diabetes mellitus, Cirrhosis of liver, Gall stones
5	Urinary System	Basic organization; Nephron - Parts, Podocytes, Collecting system, Kidney - Cortex Medulla, Ureter, Urinary bladder.	Juxtaglomerular Apparatus, Urethra
6	Male Reproductive System	Basic organization; Gonads, Tract, Accessory glands, Testis section; Epididymis section; Vas deferens section; Prostate section	Blood Testis Barrier, Stages of Spermatogenesis Penis, Seminal vesicle
7	Female Reproductive System	Basic organization; Gonads, Tract, Accessory glands; Ovary - with Corpus Luteum; Fallopian tube; Uterus; Cervix; Vagina, Mammary gland Active, & Passive.	Stages of maturation of ovarian follicle, Phases of menstruation
8	Endocrine System	Pituitary: Adenohypophysis; Neurohypophysis; Thyroid: Follicular, Para follicular cells; Parathyroid: Chief cells, Oxyphil cells, Adrenal gland	Hypothalamo-pituitary Portal system Synthesis of thyroid hormone.
	<b>Nervous System</b>		
9	Central	Basic organization; Cerebrum; Cerebellum	Neuronal circuit of cerebellum
10	Peripheral	Sensory ganglia; Autonomic ganglia (sympathetic ganglion); Peripheral nerve TS & LS	Receptors – Proprioceptors, Exteroceptive, Introceptive
	<b>Special Senses</b>		
11	Visual	Eyeball Cornea; Sclerocorneal junction, Canal of	Keratoplasty, Eye donation,

		Schlemm; Lens , Retina , Optic nerve	Cataract
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### SECTIONAL ANATOMY

#### I) Superior extremity / Upper Limb

- a) Mid arm (Insertion of coracho brachialis) T.S.
- b) Hand – Cross section

#### II) Inferior Extremity / Lower Limb

- a) Mid-thigh (Passing through adductor canal) T.S.
- b) T.S. of leg just below soleal line.
- c) Sagittal section of foot.

#### III) Abdomen

- a) T.S. at Trans pyloric plane (L1)
- b) Mid sagittal of pelvic region in males
- c) Mid sagittal of pelvic region in females

#### IV) Thorax

- a) T.S. at sternal angle (T4)

#### V) Head Neck and Face

- a) T.S. at C4 level

#### VI) Brain

- a) Spinal cord: Cervical, thoracic, lumbar, sacral
- b) Medulla oblongata: Sensory and motor decussation,  
Mid olivary level.
- c) Pons – Upper part & lower part
- d) Mid brain –
  - At level of sup. Colliculus.
  - At level of inf. Colliculus.

### Self-Dissected Learning (SDL)

<b>Sr.No.</b>	<b>Topic</b>
1	Lungs (Gross, Histology, Embryology)
2	Kidney (Gross, Histology, Embryology)
3	Abdominal wall incision
4	Palmar Spaces
5	Mid-Tarsal Joints

### CASE BASE LEARNING

<b>Sr.No.</b>	<b>Topic</b>
1	Lower Limb -Varicose Vein
2	Upper Limb - lump in Mammary Gland
3	Thorax - Mediastinal shift
4	Abdomen - Appendicitis
5	Pelvis – Prolapse of Uterus
6	HNF – Bell’s Palsy/Squint
7	Neuroanatomy - Cerebellar Ataxia
8	Lymphoid Tissue - Lymphoma

9	Pancreas - Diabetes
10	Thyroid –Goitre
11	Eye ball – Hypermetropia

DYPATIL MEDICAL COLLEGE  
DEPARTMENT OF ANATOMY  
THEORY – QUESTION PAPER PATTERN FOR PAPER I

**[Head Neck Face, Central Nervous System, Upper Limb and Thorax; Including Systemic Histology, Systemic Embryology and Sectional Anatomy]**

Total Marks: 50

Duration: 2 ½ hrs.

**SECTION – A**

Q.1 Multiple choice questions      10 questions      10 X 1 = 10 marks  
(Based on whole syllabus)

**SECTION – B**

Q.2 Long answer question (**ANY TWO OUT OF THREE**) 2x8=16 marks

- a) Head Neck Face and Central Nervous System
- b) Thorax
- c) Upper Limb

Q.3 Short notes      (**ANY SIX OUT OF EIGHT**)      6 x 4 = 24 marks

- a) CNS
- b) Sectional Anatomy
- c) Systemic Histology
- d) Systemic Embryology
- e) Thorax
- f) HNF
- g) Upper Limb
- h) Systemic Embryology



DYPATIL MEDICAL COLLEGE  
DEPARTMENT OF ANATOMY  
THEORY – QUESTION PAPER PATTERN FOR PAPER II

**[Abdomen, Pelvis, Perineum, Lower Limb; Including Systemic Histology, Systemic Embryology, Sectional Anatomy, General Anatomy, General Histology, General Embryology and Genetics]**

Total Marks: 50

Duration: 2 ½ hrs.

**SECTION – A**

Q.1 Multiple choice questions      10 questions      10 X 1 = 10 marks  
(Based on whole syllabus)

**SECTION – B**

Q.2 Long answer question (**ANY TWO OUT OF THREE**)      2 x 8 = 16 marks

- a) Abdomen
- b) Pelvis
- c) Lower Limb

Q.3 Short notes (**ANY SIX OUT OF EIGHT**)      6 x 4 = 24 marks

- a) Perineum
- b) Sectional Anatomy
- c) Systemic Histology
- d) Systemic Embryology
- e) Genetics
- f) General Anatomy
- g) General Histology
- h) General Embryology

There is no change in the pattern of practical examination for preclinical subjects.

**D. Y. Patil Education Society Deemed University, Kolhapur**  
**FIRST M.B.B.S. - SYLLABUS**  
**HUMAN PHYSIOLOGY**

**I) GOAL:**

The broad goal of the teaching of undergraduate students in physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and diseases.

**II) EDUCATIONAL OBJECTIVES:**

- 1) At the end of the course, the student will be able to: describe the normal functions of all the organ systems, their regulatory mechanisms and interactions of the various systems for well-coordinated total body function.
- 2) Understand the relative contribution of each organ system in the maintenance of the milieu interior (homeostasis).
- 3) Explain the physiological aspects of normal growth and development.
  - a. Analyse the physiological responses and adaptation to environmental stresses.
- 4) Comprehend the physiological principles underlying pathogenesis and treatment of disease.
- 5) Correlate knowledge of physiology of human reproductive system in relation to National Family Welfare Programme.

**III) SKILL:**

At the end of the course the student shall be able to:

- 1) Conduct experiments designed for study of physiological phenomena.
- 2) Interpret experimental/investigative data.
- 3) Distinguish between normal & abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

#### **IV) INTEGRATION:**

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

#### **V) COURSE CONTENT:**

Theory

List of topics.

A) GENERAL PHYSIOLOGY. (5 hours)

##### **Must know.**

- Introduction to Physiology
- Branches of Physiology
- Functional organization of human body.
- External and internal environment
- Homeostasis, Biofeedback mechanisms

Cell Physiology:

- Transport across cell membrane.
- Stem Cells & Cloning

***B) HEMATOLOGY: (15 hours)***

##### **Must know**

- Composition of blood
- Functions of blood
- Plasma proteins: Types, concentration, functions.
- Erythrocytes: Morphology, functions, normal count, physiological variations in normal count & anaemia, polycythemia.
- Haemopoiesis: general concepts
- Erythropoiesis: stages, Sites, regulation, reticulocyte & its clinical significance.
- Haemoglobin: Functions, normal values, physiological variations.
- Fate of erythrocytes: life span, Catabolism of Hb, bilirubin metabolism, jaundice.
- Physiological basis of anaemia, nutritional anaemia.
- Polycythemia: Primary & secondary.

- Leukocytes: differences between R.B.C. & W.B.C., types of W.B.C.s normal count & differential W.B.C. count, physiological variations, properties, functions of W.B.C.s, Granulopoiesis – stages, regulation, Lymphopoiesis.
- Pathological variations in total & differential W.B.C. count.
- Immunity: definition, concept of antigen & antibody, types of immunity-Innate & Acquired, & their mechanism, cell mediated & humoral immunity, B lymphocytes, T lymphocytes & their types.
- Primary & secondary response, basis of vaccination.
- Blood groups: Landsteiner's law,
- ABO System – type A & B antigen, ABO system & inheritance, relation to transfusion, cross matching major & minor.
- Rh System – inheritance, Rh incompatibility & blood transfusion, Erythroblastosis foetalis.
- Blood transfusion: indications, storage of blood & changes during storage, transfusion reactions.
- Monocyte - macrophage system: Classification, functions, functions of spleen.
- Haemostasis: definition, basic mechanisms of Haemostasis,
- Platelets: structure, normal count & variations, functions, role in platelet plug formation, Haemostasis & clot retraction.
- Blood coagulation: Coagulation factors in plasma, basic mechanism of blood clotting, intrinsic & extrinsic pathways & difference between two pathways, role of calcium in coagulation, role of vitamin K, fate of clot.
- Anticoagulants – commonly used & their mechanism of actions, blood coagulation tests – bleeding time, clotting time.
- Haemophilia.
- Body fluid compartments: role of water in body & its distributions, different body fluid compartments & composition of their fluid.
- Blood volume: normal value, physiological & pathological variations, blood volume regulation in detail (To be taken at end of lectures on C.V.S, kidney and endocrines)

**Desirable to know**

- Physical properties of blood.

- Plasma proteins: Plasmapheresis, role of liver in plasma protein synthesis, relationship of diet & plasma protein synthesis.
- R.B.C.: advantages of biconcave shape.
- Bone marrow structure and cellular elements.
- Common Haemoglobinopathies (Hbs, Hbc, Thalassaemia)
- Method of determination of life span of R.B.Cs.
- Types of jaundice.
- Polycythemia – effects on haemodynamics,.
- Immunity: Antibody structure & types, antigen – antibody reactions.
- Blood group: M. N. system, other blood groups.
- Thrombocytosis, thrombocytopenia purpura.
- Anticoagulants: used in vitro & in vivo.
- Other blood coagulation tests.
- Classification of haemorrhagic diseases, D.I.C.
- Measurement of: total body water, blood volume, plasma volume, I.C.F. volume.

**Nice to know**

- Blood component therapy.
- Effects of splenectomy.
- Plasmin system.

**C) NERVE (5 hours)**

**Must know:**

- Distinctive histological features relevant to functions of nerve fibers.
- Classification of nerve fibers: based on structure, diameter, functions and only for sensory nerves.
- R.M.P. definition, production & maintenance, method of measurement, significance.
- Action potential: definition,  
Phases – depolarization, repolarisation, ionic basis of depolarization & repolarisation.  
Production & propagation of A.P.,  
Properties of A.P., significance.
- Properties of nerve fibers.

- Strength duration curve: chronaxie and factors affecting it.
- Factors affecting conduction in a nerve.

**Desirable to know:**

- Experimental techniques to study the mechanism of production of R.M.P. & A.P.: patch clamp, voltage clamp
- Methods of recording of A.P.

**D) MUSCLE (7 hours)**

**Must know.**

- Classification of muscles,
- Structure of skeletal muscle:
- Electron microscopic structure, muscle proteins – contractile, regulatory, structural & enzymatic.
- Sarcoplasmic tubular system: concept of sarcoplasmic triads & their functions.
- Neuromuscular transmission: Physiologic anatomy, events, N-M blocking & its clinical significance, applied aspect – myasthenia gravis.
- Excitation – contraction coupling.
- Molecular basis of skeletal muscle contraction: sliding filament theory, power stroke – cross bridge cycle, role of calcium.
- Energetics: fuel used by skeletal muscle at rest & in exercise, metabolic pathways involved to yield A.T.P.,
- Oxygen debt: definition, types (lactic, alactic), incurring of debt, repaying the debt, significance.
- Properties of skeletal muscle: excitability, refractory period (absolute, relative), conductivity, contractility – types (isometric, isotonic), effects of summations (multiple motor unit summation, frequency summation & tetanizibility), all or none law, extensibility & elasticity, fatiguability.
- Factors affecting development of tension in the muscle:
  - a) Number of motor units contracting- type of muscle, number of muscle fibers in each unit activated, supraspinal influences.
  - b) length – tension relationship
  - c) frequency of stimuli, duration of stimulation

- d) load
- e) type of contraction
- f) Chemical composition of muscle fibers and ions.
- E.M.G. (in brief)
- Skeletal muscle circulation.
- Smooth muscle: structure, distribution, types, molecular mechanism of contraction, properties, regulation and disorders.

**Desirable to know**

- Heat liberated during various phases of contraction, Fenn effect.
- Recording of muscle activity.

**Nice to know**

- E.M.G. details.

***E) RESPIRATORY PHYSIOLOGY (15 hours)***

**Must know:**

- Physiologic anatomy
- Functions of respiratory system, non respiratory functions of lung
- Mechanics of respiration:

Ventilation:

Inspiratory & expiratory muscles, intrapleural pressure, lung & thoracic compliance, factors affecting compliance, work of breathing, surface tension forces, role of surfactant, airway resistance and elastic resistance.

- Lung volumes and capacities. Measurement, physiological significance (tidal volume, vital capacity, forced vital capacity – details)
- Pulmonary ventilation, alveolar ventilation, alveolar dead space, - applied aspect, Maximum breathing capacity & breathing reserve.

Diffusion of Gases:

- Exchange of respiratory gases at alveolar – capillary membrane, factors affecting diffusion.

#### Gas Transport:

- Transport of oxygen, role of Haemoglobin, oxygen dissociation curve & factors affecting it.
- Transport of carbon dioxide

#### Control of Breathing:

Neural control – higher centers, reflexes.

Chemical control – central & peripheral chemoreceptor's , role of CO<sub>2</sub>, O<sub>2</sub>, H<sup>+</sup>

#### Pulmonary Circulation

- Characteristics
- Ventilation perfusion ratio
- Respiratory adjustment in exercise.
- Hypoxia: types & high altitude hypoxia.
- Artificial respiration and cardiopulmonary Resuscitation
- Pulmonary function tests - principles

#### **Desirable to know.**

- Method of determination of dead space, residual volume, functional residual capacity.
- Oxygen therapy: indications, hazards of hyperbaric oxygen & use.

#### **Nice to know**

- Concept of P<sub>50</sub>
- Positive pressure breathing.

### **F) CARDIOVASCULAR PHYSIOLOGY (20 hours)**

#### **Must know:**

- Introduction, functions & importance of the system.
- General organization.
- Structure of heart, pericardium, myocardium, endocardium, nerve supply, Histology, details of cell junctions, syncytium, contractile & conducting fibers.
- Properties of cardiac muscle: excitability, conductivity, contractility, autorhythmicity, all or none law, long refractory period.
- Junctional tissues of heart, pacemaker potential, action potential of cardiac muscle.



- Generation & conduction of cardiac impulse.
- ECG: lead arrangement, normal waves & their significance with reference to lead II
- Cardiac cycle: pressure – volume changes, heart sounds & their clinical significance, correlation of pressure, volume, ECG, heart sounds in cardiac cycle.
- Heart rate & its regulation.
- Haemodynamics – definition ,blood flow, resistance
- Cardiac output: normal values, physiological variations, factors affecting cardiac output – details, regulation, methods of measurement of cardiac output – **old methods in short and newer methods like echocardiography its principles and its uses in detail.**
- Blood pressure:

Normal levels, measurement, determinants, short term & long term regulation - details.

- Capillary circulation, tissue fluid formation.
- Lymphatic system: Anatomy & structure, formation of lymph, composition of lymph, functions of lymphatic system, lymph flow, factors affecting it & Pathophysiology of oedema.
- Regional circulation: Physiologic anatomy, factors affecting, special features: coronary, cerebral, skin, portal
- Adaptation of cardiopulmonary system to various grades of exercise.
- Haemorrhagic shock – stages & compensatory mechanisms, effects on body, physiological basis of treatment in brief.

**Desirable to know:**

- Ion channel & receptors (physiological, pharmacological & clinical significance)
- E.C.G. – electrical axis of heart, heart blocks, arrhythmias, ischaemia, infarctions.
- Heart sounds: murmurs & their clinical significance.

**Nice to know**

- Experimental methods of studying cardiovascular physiology,

**G) RENAL PHYSIOLOGY (10 hours)**

**Must know:**

- General introduction, structure & functions of kidney.
- Renal circulation: special features from functional point of view.

- Concept of clearance: to study renal physiology, for :
  - a) GFR – Inulin, Creatinine, basic principle of radioisotope method.
  - b) Renal blood flow – PAH
  - c) Concentration & dilution of urine – free water.
- Formation of urine:
  - 1) Glomerular stage – GFR (definition, dynamics, factors affecting & measurement))
  - 2) Tubular stage – Reabsorption & secretion.
    - a) Sodium, potassium, glucose : details
    - b) Handling of water – concentration & dilution of urine.
    - c) Secretion of H<sup>+</sup>
  - 3) Role of kidney in acid – base balance.
- Physiology of micturition: basic reflex & control, cystometrogram.
- Artificial kidney: basic principles of dialysis.

**Desirable to know:**

- Disorders of micturition..

**Nice to know**

- Experimental studies for renal functions

***H) BODY TEMPERATURE REGULATION: (2 hours)***

**Must know:**

- Homeothermia – Balance between heat gain & heat loss.
- Regulation of body temperature,

**Desirable to know:**

- Hyperthermia, Hypothermia.

***I) ALIMENTARY SYSTEM: (12 hours)***

**Must know:**

- General introduction & organizational plan, innervations and blood supply.

Salivary secretion:

- General principles & basic mechanisms of secretion, composition, and functions of saliva, mechanism & regulation of salivary secretion.

Mastication and deglutition:

- Three phases of deglutition- physiologic anatomy, mechanism & control

Gastric secretion:

- Functional anatomy, histology, functions of stomach, composition of gastric juice, cellular mechanism of gastric secretion of acid, pepsin, intrinsic factor, other enzymes, phases of gastric secretion, regulation of gastric secretion.

- Gastric mucosal barrier, experiments to study regulation of gastric juice secretion, disorders of secretion, peptic ulcer, inhibitors of gastric secretion

- Gastric Motility:

Electrical activity of stomach, pylorus, emptying of the stomach-pyloric pump, regulation, factors promoting & inhibiting emptying.

Pancreatic secretion:

- Structure, composition & mechanism of secretion of electrolytes & enzymes, regulation of secretion.

- Liver & gall bladder:

Microscopic structure, functions of liver, composition of bile, cellular mechanism of bile formation, enterohepatic circulation of bile salts, control of secretion, concentration & storage of bile in gall bladder. Filling & evacuation of gall bladder functions of gall bladder

Intestinal secretion:

- Structure, innervations.

- Composition & mechanism of secretion of small intestinal juice, regulation of secretion.

- Secretion of large intestine: mucous, water, electrolyte.

- Motility of small intestine:

Structure & innervations, electrical activity of smooth muscle, resting membrane potential, slow waves, spike potentials, rhythmic segmenting contractions, peristalsis, control – neural & hormonal, functions of ileocecal valve.

- Motility of large intestine:

- Structure & innervation, mixing & mass movements, defecation reflex and its control

- G.I. hormones: in brief.

Digestion & absorption:

- Digestion & absorption of
  - carbohydrate,
  - Proteins
  - Fats

Absorption of water, electrolytes and vitamins.

**Desirable to know:**

- Effects of vagotomy, abnormal gastric motility, vomiting.
- Barium meal studies, endoscopy, biopsy.
- Pathophysiology of small intestinal motility, paralytic ileus, diarrhea, obstruction.
- Pathophysiology of colonic motility, irritable bowel syndrome, drugs, constipation.
- Pancreatic function tests.
- Gall stone, effects of removal of gall bladder

**Nice to know**

- Disturbances of esophageal motility, spasm, achalasia, hiatus hernia.
- Methods for study of intestinal absorption.
- Effects of hepatectomy.

***J) NUTRITION: (2 hours)***

**Must know:**

- concept of balanced diet
- factors affecting caloric requirements
- Requirements of various nutrients, sources, daily needs.
- Nutrition under special conditions – pregnancy, lactation, growing child.

***K) ENDOCRINE SYSTEM (10 hours)***

**Must know:**

- Introduction
- Endocrine functions of Hypothalamus – releasing hormones, Mechanism of hormone action
- Anterior pituitary hormones:
  - Functions,regulation, disorders.
- Posterior pituitary hormones, ADH, Oxytocin. Functions,regulation, disorders.

Thyroid:

hormone: synthesis, fate, functions, regulation, disorders.

- Parathyroid:

hormone: synthesis, functions, regulation, disorders – tetany.

- Adrenal cortex: and medulla.

hormone: secretion, functions, regulation, disorders

- Pancreatic hormones:

secretion, functions, regulation, disorders.

**Desirable to know:**

- Radioimmuno assays.

**Nice to know**

- Experimental studies.

***L) REPRODUCTIVE PHYSIOLOGY: (8 hours)***

**Must know:**

- Sex chromosomes, sex determination, sex differentiation

- Functional anatomy of reproductive system.

- Puberty: changes in males & females and its control.

- Spermatogenesis: stages & regulation

Semen analysis.

- Testosterone: actions & regulation.

- Male sexual act.

- Menstrual cycle & ovarian cycle:

Phases & hormonal regulation.

- Menopause.

- Ovulation: indicators & importance

- Fertilization, implantation of ovum.

- Functions of placenta

- Physiology of pregnancy;

- Maternal changes during pregnancy

- Parturition: in brief – stages and mechanism.

- Lactation: initiation ,maintenance and control.  
Advantages of breast-feeding.
- Contraception: to be taken as integrated topic.

**Desirable to know:**

- Sex chromosomes: Barr bodies.
- Development of genitals & gonads

**Nice to know**

- Precocious & delayed puberty.

**M) SPECIAL SENSES ( 8 hours)**

**Must know:**

- Eye:

Functional anatomy of eye, optics, microscopic structure of retina with retinal circuits, image formation,

Photochemistry of vision (photopic & scotopic vision, dark & light adaptation),

Pupillary reflexes, Accommodation reaction, Errors of refraction and their correction,

Colour vision – physiological & neural basis, accepted theory of colour vision, classifications, basis of colour blindness and tests of colour blindness, significance.

Visual pathway – processing of information at different levels in visual pathway, organization of visual cortex. Effects of lesion at different levels in visual pathway,

Movements of eyeballs: functions & control.

- Ear:

Physics of sound, decibel system,

Functions of external ear,

Functional anatomy of middle ear, functions of middle ear in detail, assessment of functions of middle ear, Functional anatomy of cochlea, functions of inner ear, place principle, theories of hearing.

- Audiometry,

Auditory pathway & important features, auditory cortex (role in hearing & speech development)

- Taste:

Functional anatomy of taste buds, different taste modalities, pathway, factors affecting taste sensation,

- Smell:

Functional anatomy of receptors, primary olfactory sensations, pathway, factors affecting smell sensation.

**Desirable to know:**

- Resolution of images,
- Electrophysiology of internal ear: cochlear micro phonics.

**Nice to know**

- Electrophysiology of retina.
- Theories of hearing.

***N) CENTRAL NERVOUS SYSTEM: (50 hours)***

**Must know**

- Outline of nervous system.
- 1) General nervous system:
- Synapse: definition, physiological anatomy, sequence of events of synaptic transmission, properties, (state the property & its significance), significance of synaptic transmission, applied aspect.
- Neurotransmitters – in brief.
- Receptors: definition, classification (basis of each classification with Example), properties (state each property with underlying mechanism & significance), significance (homeostasis, conscious awareness of environment, tone, posture, protection).
- Sensations: different modalities, classification with examples and significance
- Sensation of touch, pain, proprioception: details of each
- Reflexes: definition, classification (basis of classification with example), reflex arc & its components, properties (state each property with basis & importance)

Stretch reflex – definition, muscle spindle (details with innervation, role of gamma motor neurons) role of supra spinal control – in brief, functions of stretch reflex (regulation of muscle tone) inverse stretch reflex.

Polysynaptic reflexes: withdrawal reflex.

## 2) Tracts:

Ascending & descending tracts: details of each tract – (situation & extent in spinal cord, origin, course & termination, collaterals, somatotopic arrangement, functions, applied aspect, tests)

Ascending tracts: Basic plan of somatosensory pathway for conscious sensation, pathway from head, face region.

Descending tracts: pyramidal tracts – details, extra pyramidal tracts, Differences between UMN & LMN lesions.

## 3) Sections at various levels in CNS:

### a) Spinal transection – spinal animal.

Complete – 3 stages – spinal shock, stage of recovery and stage of reflex failure – details of each stage.

Incomplete Transection

Hemisectomy

### b) Low midbrain section – decerebrate animal : Decerebrate rigidity. (Classical & ischaemic with mechanisms, characteristics features, physiological significance)

### c) High midbrain section – High decerebrate animal.

### d) Thalamic or Decorticate animal.

## 4) Posture & Equilibrium.

Definition, classification of postural reflexes.

(Details of each reflex and its function.)

regulation of posture (integrating centers at various levels of CNS) vestibular apparatus: Physiologic anatomy, mode of function of utricle & saccule and semicircular canals, vestibulo ocular & vestibulo spinal reflexes.

## 5) Thalamus:

Functional classification of Thalamic nuclei, with connections of different nuclear groups, functions of thalamus, thalamic syndrome.



6) Hypothalamus: Functional classification of different hypothalamic nuclei, connections in brief, functions in details.

7) Limbic system: Parts of limbic system, connections in brief, functions.

8) Reticular formation:

Introduction, anatomy in brief, functional divisions.

(A) Ascending reticular activating system – details with connections & role in sleep wakeful cycle, applied aspect.

(B) Descending reticular system – role in regulation of muscle tone by pontine & medullary regions.

(C) Visceral centres.

9) E. E. G.:

Definition, different waves, characteristics & functional significance of each wave, physiological variation, clinical application in brief.

10) Sleep & Wakefulness:

Concept of alertness & wakefulness with their physiological basis,

Definition of sleep, stages of sleep correlated with EEG, sleep cycle – types of sleep, salient features of NREM & REM sleep, physiological effects of sleep on different systems of the body, Neurophysiological mechanisms of sleep, functions of sleep.

11) Cerebellum:

Introduction, functional classification, intracortical circuit, deep cerebellar nuclei, connections of different lobes, functions of cerebellum, cerebellar function tests, effects of lesion in brief.

12) Basal Ganglia:

Introduction, classification of nuclei, connections, intracortical circuits, functions, lesions - Parkinsonism.

13) Cerebral Cortex:

Gross anatomy & divisions, concept of Brodmann's mapping with diagram, Parietal lobe – anatomical & functional divisions, details of each functional part as regards connections, topographic organisation, functions.

Frontal lobe – excitomotor Cortex – anatomical & functional parts, details of each part as regards connections, topographic organisation, functions.

Prefrontal Cortex – different areas, connections in brief, functions, effects of lobectomy.

14) speech –

Afferent and efferent mechanisms and role of cortical centers in speech, concept of cerebral dominance, development of speech, vocalization.

15) Memory:

Definition, stages, types, physiological basis, factors affecting, applied – amnesias in brief.

16) Learning:

Definition, types with examples, stages, factors influencing, role of motivation (positive & negative reinforcement, reward & punishment), physiological basis – role of different parts of CNS, structural, biochemical changes.

17) Conditioned reflexes:

Definition, difference between unconditioned & conditioned reflexes, development of conditioned reflexes, properties, significance.

18) Autonomic nervous system:

Organization and functions of Parasympathetic & Sympathetic and their control.

19) CSF:

Introduction, composition, normal CSF pressure, formation & circulation, functions, applied aspect – brief, blood brain barrier, blood CSF barrier.

**Desirable to know:**

General nervous system:

Neurotransmitters – details, susceptibility of synapse to hypoxia & drugs etc., Mechanisms of referred pain, differences between superficial & deep pain, central analgesia system, supraspinal control of stretch reflex – details.

Thalamus - applied aspects – effects of lesions.

Hypothalamus - applied aspects – effects of lesions

Reticular formation – effects of lesion

EEG – Method of recording, abnormal patterns.

Basal Ganglia – lesions, involuntary movements.

Cerebellum – Embryology, evolution, effects of stimulation & ablation.

Cerebral cortex – effects of stimulation & ablation in different regions.

Speech – aphasias.

### **Nice to know**

Experimental studies – effects of stimulation & ablation.

Sleep, wakefulness – effects of sleep deprivation, disorders.

- Topics to be asked as applied questions in theory.

A brief history and diagnosis to be provided.

1. Erythroblastosis foetalis
2. Haemophilia, purpura
3. Myasthenia gravis
4. Peptic ulcer
5. Oedema
6. Jaundice and anaemia – due to mismatched transfusion
7. Myxoedema
8. Cretinism
9. Hyperthyroidism
10. Tetany
11. Acromegaly, Gigantism
12. Respiratory distress syndrome
13. Parkinsonism
14. Asthma
15. Hemiplegia
16. Spinal cord injury
17. Deafness
18. Haemorrhagic shock
19. Cushing's syndrome
20. Dwarfism

- Recent diagnostic Techniques:

- 1) Ultra Sonography
- 2) C.T. Scan
- 3) M.R.I.
- 4) Angiography
- 5) E.L.I.S.A. techniques

**Books recommended:**

1) Textbooks of Physiology :

- Guyton - Textbook of Physiology
- Ganong - Review of Medical Physiology
- A.K. Jain - Text book of Physiology Vol. I & II

2) Reference Books :

- Best and Taylor - Physiological basis of medical practice
- Berne & levy. - Principles of Physiology
- Dr. V.G. Ranade - Laboratory Manual and Journal of Physiology

**Practicals**

(A) Haematology

Hb%, R. B. C. ,W. B. C. ,Differential, B.T.C.T. Blood group, ABO system Rh typing, Blood Indices.

(B) Clinical examination –

- Introduction of Bioethics as a part of clinical examination.
- Clinical examination of all systems
- Practical - Artificial respiration in Man and **demonstration on cardiopulmonary resuscitation on manikin.**

(C) Human experiments

Stethography, Spirometry, Ergography, Perimetry, Tests for physical fitness,.

(D) Demonstrations

Reticulocyte count. Platelet count, P. C. V., E. S. R, osmotic fragility, peripheral blood smear, and bone marrow slides,

E.M.G. S.D. curve, conduction velocity of nerve (Human), E.C.G., E.E.G., Audiometry, H.R.T. (Human reaction time)

Visit to blood bank, wards to show common disorders or video tapes (list given in appendix I), X-rays (list given in appendix II)

Animal experiments on frogs,

a) Skeletal muscle:

Effect of graded stimuli,

Simple muscle twitch

Genesis of tetanus,

Effect of load on skeletal muscle

Fatigue.

b) Cardiac muscle.

normal cardiogram, effect of temperature, properties of cardiac muscle, effect of vagal stimulation and phenomenon of vagal escape. effect of drugs (Acetyl choline, Adrenaline, Nicotine) on frog's heart. perfusion of isolated frogs heart with effects of  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Ca}^{++}$ , and demonstration of Starling's law Historical land marks, Nobel laureates

## **APPENDIX I**

List of common disorders to be shown during ward visits or using video tapes.

1. Generalised Oedema
2. Anaemia
3. Jaundice
4. Hepatomegaly
5. Splenomegaly
6. Ascites
7. Myxoedema
8. Cretinism
9. Hyperthyroidism
10. Dwarfism
11. Acromegaly
12. Facial nerve paralysis
13. Hemiplegia
14. Paraplegia
15. Parkinsonism
16. Cerebellar dysfunction.

## **APPENDIX II**

List of X-rays to be shown along with clinical examinations to improve understanding.

1. Normal X-ray chest
2. Consolidation of lung
3. Pleural effusion showing mediastinal shift
4. Collapse of lung / cavity in lung
5. Hyper inflated lungs in emphysema
6. Left ventricular hypertrophy showing shift of apex beat
7. Barium meal follow through – oesophagus, stomach, small and large intestine

**VII) EVALUATION:**

**PAPER PATTERN FOR TERMINAL EXAMINATION IN PHYSIOLOGY.**

**THEORY TOTAL: 60 Marks**

**TOTAL TIME : 2 ½ Hours**

**SECTION - A**

**Q. 1 - M.C.Q. - 20 (20x1) 20 Marks 30 Minutes**

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**SECTION – B**

**20 Marks**

**Q. 2- Write notes on: (any THREE out of Four) (3x4) 12 Marks**  
a.  
b.  
c.  
d.

**Q. 3- Long Answer Question: (any ONE out of two) (1x8) 08 Marks**

**SECTION – C**

**20 Marks**

**Q. 4- Write notes on: (any THREE out of Four) (3x4) 12 Marks**  
a.  
b.  
c.  
d.

**Q. 5 –Long Answer Question (any ONE out of two) (1x8) 08 Marks**

**40 Marks**

\*\*\*\*\*

**Practical Pattern for terminal examination**

Practical - 60 marks  
Viva - 20 marks (to be added to theory)

**Practical - 60 Marks**

- A) Haematology -10 Marks
- B) Clinical Exam – I (RS) – 10 Marks  
Clinical Exam – II (CVS) – 10 Marks
- C) Case history -10 Marks
- D) X-ray - 5 Marks
- E) Journal – 5 Marks
- F) Short Exercise in the form of spotting – 10 Marks
  - Which includes charts on
    1. Amphibian Experiments
    2. Human experiments
    3. Calculations
    4. Endocrine conditions

**Total**

**- 60 Marks**

\*\*\*\*\*



**Details of Physiology Examination.  
For Preliminary & University Examination**

**Paper – I**

**Topic :** (CVS, Endocrinology, GIT, Respiratory System, Reproductive system, Temp. Regulation & Exercise Physiology)

**Total Marks -50**  
2½ hrs

**Duration -**

**SECTION - A**

<b>Q. 1</b>	-	<b>M.C.Q.- 10</b>	(10x1)	10
<b>Marks</b>				

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**SECTION – B** **40**  
**Marks**

**Q. 2** Long answer question (any **TWO** out of **three**) 2 x 8 = 16 Marks  
(Based on topics from Must know group)

**Q.3** Short notes (any **SIX** out of **EIGHT**) 6 x 4 = 24 Marks  
(Based on topics from Must know & Desirable to know group)

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)

\*\*\*\*\*

**Paper – II**

**Topic:** (General Physiology, Nerve & Muscle, Blood, Excretory, CNS, Special senses)

**Total Marks -50**

**Duration -2½ hrs**

**SECTION - A**

Q. 1 - M.C.Q. - 10

(10x1) **10 Marks**

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**SECTION – B**

**40 Marks**

**Q. 2-** Long answer question (any **TWO** out of three)  
(Based on topics from Must know group)

(2 x 8) **16 Marks**

**Q.3** Short notes (any **SIX** out of eight)  
(Based on topics from Must know & Desirable to know group)

(6 x 4) **24 Marks**

- a)
  - b)
  - c)
  - d)
  - e)
  - f)
  - g)
  - h)
-

**PRELIMINARY & UNIVERSITY PRACTICAL EXAMINATION IN PHYSIOLOGY**

<b>Practical:</b>	<b>60 Marks</b>
<b>Viva :</b>	<b>20 Marks (added to theory)</b>
<b>Practical :</b>	
A) Haematology	-10 Marks
B) Clinical Exam – I (RS & CVS)	– 10 Marks
Clinical Exam – II (C.N.S & Abdomen)	– 10 Marks
C) Case history	-10 Marks
D) X-ray	- 05 Marks
E) Journal	– 05 Marks
F) Short Exercise in the form of spotting	– 10 Marks
➤ Which includes charts on	
1. Amphibian Experiments	
2. Human experiments	
3. Calculations	
4. Endocrine conditions	
	<hr/>
<b>Total</b>	<b>- 60 Marks</b>

**PHYSIOLOGY 1<sup>ST</sup> M.B.B.S.**

**UNIVERSITY EXAMINATION PATTERN**

	<b><u>THEORY</u></b>	<b><u>PRACTICALS</u></b>	<b><u>INTERNAL ASSESSMENT</u></b>
Marks	Paper I - 50 Marks	Haematology - 10 Marks	Theory - 10
Marks	Paper II - 50 Marks	Clinical I - 10 Marks	Practical - 10
	Viva-voce - 20 Marks	Clinical II - 10 Marks	
		Case History - 10 Marks	
		X-ray - 05 Marks	
		Journal - 05 Marks	
		Spotting -10 Marks	
<b>Total</b>	<b>- 120 Marks</b>	<b>- 60 Marks</b>	<b>- 20 Marks</b>

**Total 200 marks examination**

<b>Passing Head</b>	<b>Total Marks</b>	<b>Minimum for Passing</b>
<b>A. Theory + Viva-voce</b>	<b>120</b>	<b>60</b>
<b>B. Practicals</b>		
<b>C. Internal Assessment</b>	<b>60</b>	<b>30</b>
	<b>20</b>	<b>10 *</b>
<b>Total</b>	<b>200</b>	<b>100</b>

<b><u>EXAMINATION</u></b>	<b><u>INTERNAL ASSESSMENT</u></b>		<b><u>PRACTICAL</u></b>
	<b><u>THEORY</u></b>		
A) Terminal	Paper - 60 Marks	- 20 Marks	60 Marks
	Viva-voce	- 20 Marks	
B) Preliminary	Paper – I	50 Marks	60 Marks
	Paper – II	50 Marks	
	Viva-voce	20 Marks	
<b>Total</b>	<b>200 Marks</b>		<b>120 Marks</b>
	(divided by 20 to convert to 10)		(divided by 12 to convert to 10 )

**\* Minimum 35 % in internal assessment in theory + practicals (i.e. 7 out of 20) to be eligible to appear for final examination.**

**HUMAN BIOCHEMISTRY**  
**Human Biochemistry – Phase I M.B.B.S.**

**i) Goal :-**

The broad goal of the teaching of undergraduate students in biochemistry is to make them understand the scientific basis of the life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems.

**ii) Objectives :-**

**a) Knowledge**

At the end of the course, the student shall be able to :

- 1) describe the molecular and functional organization of a cell and list its subcellular components;
- 2) delineate structure, function and inter-relationships of biomolecules and consequences of deviation from normal;
- 3) summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered;
- 4) describe digestion and assimilation of nutrients and consequences of malnutrition;
- 5) integrate the various aspects of metabolism and their regulatory pathways;
- 6) explain the biochemical basis of inherited disorders with their associated sequelae;
- 7) describe mechanisms involved in maintenance of body fluid and pH homeostasis;
- 8) outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine.
- 9) Summarize the molecular concept of body defences and their application in medicine;
- 10) Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
- 11) familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of given data;
- 12) suggest experiments to support theoretical concepts and clinical diagnosis;

**b) SKILLS**

At the end of the course, the student shall be able to:

- 1) make use of conventional techniques / instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
- 2) analyse and interpret investigative data;
- 3) Demonstrate the skills of solving scientific and clinical problems and decision making.

**c) INTEGRATION**

The knowledge acquired in biochemistry shall help the students to integrate molecular events with structure and function of the human body in health and disease.

**A) Total no. of teaching hours allotted to Human Biochemistry – 240 hrs.**

**B) Theory examination :**



**Desirable to know:**

11. **Introduction to Biochemistry** as a basic science for the study of medicine, It's importance in clinical practice.
12. **Cell:** Molecular and functional organization of cell & it's subcellular components.
13. **Nutrition:** Balance diet for normal adult, Quality of dietary protein, SDA, Protein energy malnutrition (Kwashiorkar and Marasmus).
14. **Molecular concept of body defence and their applications :**
  - A) Immunoglobulins-structure & functions,
  - B) Free radicals enzymatic and non-enzymatic antioxidants.,

**Nice to know:**

15. **Molecular Diagnostics**

**Case studies to be discussed in Paper I**

1. 01.Phenylketonuria
2. 02.Albinism
3. 03.Vitamin A deficiency
4. 04.Scurvy
5. 05.Pellagra
6. 06.Vitamin B<sub>12</sub> deficiency
7. 07.Rickets
8. 08.Osteomalacia
9. 09.Kwashiorkar
10. 10.Gout
11. 11.Thalasaemia major

**Paper – II: 50 marks    2 ½ hrs duration**  
**Ist M.B.B.S. Biochemistry Paper – II**

**Must know:**

01. **Chemistry of Carbohydrates:** Classification and Biochemical importance, Chemistry and functions of monosaccharides (including isomerism), disaccharides and polysaccharides including Glycosaminoglycans (mucopolysaccharides).
02. **Metabolism of Carbohydrates:** Biochemical aspects of digestion and absorption of carbohydrates. Synthesis & breakdown of glycogen, Glycolysis, Rapoport-Leubering cycle, Citric acid cycle, Gluconeogenesis, HMP shunt pathway and its biological significance, Uronic acid pathway(only significance). Metabolism of Galactose & Galactosemia. Blood sugar level and its regulation, Oral GTT and Glycosuria, Biochemistry of diabetes mellitus.
03. **Chemistry of Lipids :** Classification and Biological importance of triacyl glycerol, phospholipids, glycolipids, fatty acids (PUFA), prostaglandins, steroids and lipoproteins, rancidity.
04. **Metabolism of Lipids :** Biochemical aspects of digestion and absorption of lipids, Beta oxidation, Biosynthesis of saturated fatty acids only, Cholesterol biosynthesis, transport(role of HDL & LDL), excretion. Ketogenesis, ketolysis and ketosis. Adipose tissue metabolism, lipolysis and re-esterification. Fatty liver and Atherosclerosis.
05. **Metabolic interrelationships** of carbohydrate, lipid and protein metabolism.
06. **Hormones:** General characteristics and Mechanism of action hormone action. cAMP-the second messenger, phosphatidyl inositol/calcium system as second messenger.

07. **Mineral metabolism** : Study of (i) Calcium and phosphorous,(ii) Sodium, potassium & Chloride, (iii) Magnesium, copper and iodine, (iv) Iron, (v) Manganese, selenium, zinc, and fluoride. Their importance in body in brief.
08. **Water and Electrolyte balance and imbalance.**
09. **Acid base balance and imbalance.**
10. **Organ function tests** : (i) Liver function tests, (ii) Kidney function tests, (iii) Thyroid function tests
11. **Detoxication mechanisms (Bio-transformations):** Oxidation, reduction, hydrolysis, conjugation.
12. **Investigation techniques (LCD topics):** Colorimeter, Flamephotometer, Electrophoresis, Chromatography.

**Desirable to know:**

13. **Radioisotopes:** Uses of radioisotopes (therapeutic, diagnostic), hazards and precautions in Handling.
14. **Metabolic changes during starvation.**

**Nice to know:**

15. **Environmental Biochemistry:** Definition, chemical stress, air and water pollution.
16. **Biochemistry of cancer:** Carcinogens, Mechanism of carcinogenesis, **Tumour markers.**

**Case studies to be discussed in Paper II**

1. Diabetes Mellitus
2. Galactosaemia
3. Von-Gierkes disease
4. Lactose Intolerance
5. Glucose-6-P dehydrogenase
6. Atherosclerosis/Myocardial Infarction
7. Hypothyroidism/ Hyperthyroidism
8. Iron deficiency anaemia
9. Metabolic acidosis
10. Dehydration
11. Jaundice

**HUMAN BIOCHEMISTRY**

**Human Biochemistry - Phase I M.B.B.S.**

**THEORY**

**PRACTICALS**

**INTERNAL ASSESSMENT**

Paper I 50 marks	Q.A Long 20 marks	Theory 10 marks
Paper II 50 marks	Q.B Short 15 marks	Practical 10 marks
Viva-voce 20 marks	Q.C Spots 10 marks	
	Q.D Case study 10 marks	
	Q.E Journal 05 marks	
<b>Total : 120 marks</b>	<b>60 marks</b>	<b>20 marks</b>

**Total 200 marks examination**

Passing Head	Total Marks	Minimum for Passing
<b>A. Theory + Viva-voce</b>	<b>120</b>	<b>60</b>



<b>B. Practicals</b>		
<b>C. Internal Assessment</b>	<b>60</b>	<b>30</b>
	<b>20</b>	<b>10 *</b>
<b>Total</b>	<b>200</b>	<b>110</b>

**INTERNAL ASSESSMENT**

<b><u>EXAMINATION</u></b>		<b><u>THEORY</u></b>	<b><u>PRACTICAL</u></b>
A) Terminal	Paper	60 marks	60
	Viva-voce	20 marks	
B) Preliminary	Paper – I	50 marks	60
	Paper – II	50 marks	
	Viva-voce	20 marks	
<b>Total</b>		<b>200 marks</b> (divided by 20 to convert to 10)	<b>120 marks</b> (divided by 12 to convert to 10)

**\* Minimum 35 % in internal assessment in theory + practicals (ie. 7 out of 20) to be eligible to appear for final examination.**

**Theory – Question paper pattern for Paper I & II**

Total Marks : 50 Duration : 2 ½ hrs

**Section - A**

**Q.1 Multiple choice questions** **10 questions** **(10x1) 10 marks**  
(Based on whole syllabus)

**Section - B**

**Q.2 Long answer question** **(any two out of three)** **(2x8) 16 marks**  
(Based on topics from Must know group)

**Q.3 Short notes** **(any six out of eight)** **(6x4) 24 marks**  
(Based on topics from Must know & Desirable to know group)  
This will include minimum two case studies from the list given

**Details of Biochemistry Examination  
For Preliminary & University Examination  
Paper – I & II**

Total Marks : 50 Duration : 2 ½ hrs

**Section - A**

**Q.1 Multiple choice questions** **10 questions** **(10x1) = 10 marks**  
(Based on whole syllabus)

**SECTION – B**

**Q.2.L.A.Q – (Any two out of Three)** **(2X8) = 16 marks**

a) }  
b) } (Based on topics from Must know group)  
c) }

Q. 3. Short Notes **(Six out of Eight)**

(6x4) = 24 marks

- a) )  
b) )  
c) ) (Based on topics from Must know & Desirable to know group)  
d) ) This will include minimum two case studies from the list given  
e) )  
f) )  
g) )  
h) )

**D) Practical:**

Practical examination in Biochemistry will be of Two hours duration and for **60 marks.**

Pattern for practical examination:

Q.A	Long experiment (from Group A)	20 marks
Q.B	Short experiment (from Group B)	15 marks
Q.C	Spot identification (from Group C)	<b>10 marks</b>
Q.D	Case study	10 marks
Q.E	Journal	05 marks

Group A:

Blood sugar estimation, Blood urea estimation, Serum protein estimation, Serum uric acid estimation, Serum creatinine estimation, Serum bilirubin estimation, CSF analysis, Alanine aminotransferase (SGPT), Aspartate aminotransferase (SGOT), Serum Alkaline phosphatase (ALP), Serum amylase

Group B:

Urine creatinine estimation, Serum phosphorus, Serum cholesterol estimation, Tests for monosaccharides, Tests for disaccharides, Precipitation reactions of proteins, Colour reactions of proteins, Physical characteristics and normal organic constituents of urine, Urine report (abnormal constituents of urine)

Group C:

Identification of slide under microscope, Identification of Hb-derivative, Use of reagent, Identification & significance of test, Identification & use of instrument/glassware, Identification of GTT, chromatogram, and electrophoretogram

**Candidates will be allowed to use flow chart for quantitative exercise only.**

**There will be table viva on Q.A & Q.B exercise.**

**SYLLABUS FOR PRACTICALS:**

**A) Experiments:**

1. Tests for Monosaccharides
2. Tests for disaccharides

3. Precipitation reactions of proteins
4. Colour reactions of proteins
5. Urine – Physical characteristics and normal organic constituents
6. Urine report – Physical characteristics and abnormal constituents
7. Estimation of Blood sugar
8. Estimation of Blood urea
9. Estimation of Serum creatinine
10. Estimation of Urine creatinine
11. Estimation of Serum total proteins,albumin and determination of A/G ratio
12. Estimation of Serum inorganic phosphorus
13. Estimation of Serum uric acid
14. Estimation of Serum bilirubin
15. Estimation of C.S.F. sugar & proteins
16. Estimation of Serum alkaline phosphatase activity
17. Estimation of Serum amylase
18. Estimation of Serum alanine aminotransferase(SGPT) activity
19. Estimation of Serum aspartate aminotransferase(SGOT) activity
20. Spectroscopy of Hb-derivatives (Practical/Demonstration)
21. Estimation of Serum cholesterol (Practical/Demonstration)

**B) Lecture cum demonstrations:**

1. pH measurement
2. Colorimetry
3. Electrophoresis
4. Chromatography
5. Flamephotometry

**APPOINTMENT OF EXAMINERS:**

There shall be at least four examiners out of whom not less than 50% examiners must be external examiners. Of the four examiners, the senior most internal examiner will act as Chairman/Convenor. The chairman/convenor will make the distribution of Practical/viva-voce, so that all examiners will examine each candidate.

**BOOKS RECOMMENDED FOR BIOCHEMISTRY:**

**Text Books:**

1. Textbook of Biochemistry by Dr.Mrs.Pankaja Naik
2. Textbook of Biochemistry for Medical Students by Rafi
3. Medical Biochemistry by A. R. Aroor
4. Medical Biochemistry by U.Satyanarayan
5. Textbook of Medical Biochemistry by Rajinder Chawla, Tarek H. Metwally, Suchanda Sahu
6. Biochemistry for Medical students by D.M.Vasudevan & Shreekumari

**Reference Books:**

1. Harper's Biochemistry by Murray, Granner, Mayes, Rodwel
2. Medical Biochemistry by N.V.Bhagwan
3. Biochemistry by L.Stryer
4. Biochemistry by Orten & Neuhans

**TOPICS OF THE LECTURES AND APPROXIMATE NUMBER OF LECTURES, HUMAN  
BIOCHEMISTRY - FIRST PHASE- M.B.B.S.**

		Lectures
1.	Introduction to Biochemistry, Cell structure and function.	1
2.	Chemistry of Carbohydrates.	4
3.	Chemistry of Proteins.	4
4.	Chemistry of Lipids.	4
5.	Chemistry of Nucleo proteins.	2
6.	Enzymes.	6
7.	Biological oxidation.	2
8.	Chemistry and functions of Haemoglobin; abnormal haemoglobin.	2
9.	Carbohydrate Metabolism.	6
10.	Protein Metabolism.	6
11.	Lipid Metabolism.	6
12.	Integration of metabolism and metabolic changes during starvation.	2
13.	Mechanism of hormones action.	1
14.	Vitamins (Fat & Water soluble)	6
15.	Nutrition.	2
16.	Purines and Pyrimidine metabolism.	2
17.	Chemistry and functions of Nucleic acids.; Protein biosynthesis, Gene expression,mutations.	5
18.	Genetic engineering and it applications.	2
19.	Biochemistry of cancer.	1
20.	Radioisotopes.	1
21.	Haemoglobin metabolism, liver function tests,Detoxification mechanisms.	3
22.	Kidney function tests,Thyroid function tests	2
23.	Mineral Metabolism.	4
24.	Water and Electrolyte Balance.	2
25.	Acid base balance,	2
26.	Environmental Biochemistry.	1
27.	Molecular concept of body defence.	2

## PUNISHMENT

If a student/candidate is found to be guilty in the examination then the provision of punishment is as follows-

**BL 526** The Board Categories of Unfair Means Resorted to by candidate at the examinations and the quantum of punishment for each category thereof shall be as follows-

Sr. No.	Nature of Malpractice	Quantum of Punishment
a)	Possession of copying material	Annulment of the performance of the candidate at the examination in full
b)	Actual copying from the copying material	Exclusion of the candidate from examination for one additional examination
c)	Possession of another student's answer books	Exclusion of the candidate from examination for one additional examination (both the candidates)
d)	Possession of another candidate's answer book and actual evidence of copying there from	Exclusion of the candidate(s) from examination for two additional examinations. (Both the candidates)
e)	Mutual/Mass copying	Exclusion of the candidates from examination for two additional examinations.
f)	Smuggling-out or smuggling in answer book as copying material	Exclusion of the candidate from examination for two additional examinations.
g)	Smuggling-in of written answer book based on the question paper seen at the examination	Exclusion of the candidate from examination for three additional examinations.
h)	Smuggling-in of written answer book forging signature of the invigilator on the answer book or supplement	Exclusion of the candidate from examination for four additional examinations.
i)	Attempt to forge the signature of the invigilator on the answer book or supplement	Exclusion of the candidate from examinations for four additional attempts
j)	Interfering with or counterfeiting of university seal or answer books or office stationery used in the examinations.	Exclusion of the candidate from examination for four additional attempts
k)	Answer book, main or supplement written outside the examination hall or any book.	Exclusion of the candidate from examination for four additional attempts other than insertion in answer
l)	To bribe or attempting to bribe any of the person/s connected with the conduct of examinations	Exclusion of the candidate from examination for four additional attempts.
m)	Using obscene language/violence/threat at the examination centre by a candidate at the examiners.	Exclusion of the candidate from examination for four additional attempts. Examination to invigilators/center-in-charge.
n)	Impersonation at the examination.	Exclusion of the candidate from

		examination for five additional attempts (both the candidate if impersonator is student of the university)
o)	Revealing identity in any form in the answer written or in any other part of the answer book by the student at the examination	Annulment of the performance of the candidate at the examination in full.
p)	Found having written on palms or on the body, or on the clothes while in the examination	Annulment of the performance of the candidate at the examination in full.
q)	All other malpractices not covered in the aforesaid categories	Annulment of the performance of the candidate at the examination in full and severe punishment depending upon the gravity of the offence.