JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION AND RESEARCH

M B B S
CURRICULUM

Complied by

National Teacher Training Centre

JIPMER, PONDICHERRY

Departmental Objectives And Course contents

ANATOMY

PARTMENTAL OBJECTIVES

The MBBS students, at the end of the course in Anatomy, should be able to:

point out and state the gross anatomical features of various structures and organs of the human body.

recognise and state the histological features of various tissues and organs of the human body with functional correlation.

state the development of various structures of the human body, differentiate abnormal development and interpret the formation of various congenital anomalies.

state the basic principles of genetics and understand the basis of genetic disorders.

point out the features of various appearances of the normal human body in skiagrams after routine radiological investigations.

outline the internal structures in relation to the external or surface features of the body.

state the features of normal postnatal growth and recognise any variation.

apply the basic knowledge of anatomy in the practice of medical sciences and demonstrate an interest in continuing to learn advances in anatomy and apply the same in medical practice.

stain a paraffin section of any tissue or organ with hematoxylin and eosin and interpret the observations.

embalm and preserve the dead body.

identify the prominent anatomical structures in the living human being and draw inferences for the purpose of anatomical diagnosis of the disease.

10. MOLECULAR BIOLOGY

MUST KNOW:

Nucleus, DNA, chromosomes, classification, karyotype, chromosomal aberrations.

DESIRABLE TO KNOW:

Pathogenesis of chromosomal aberrations and their effects, recombinant DNA.

11. GENERAL EMBRYOLOGY

MUST KNOW:

Definition of embryology; gestation period: subdivisions; definition of gonads: testis, ovary; definition of gamete: sperm, ovum; definition of gametogenesis; migration of primordial germ cells into indefinite gonad; spermatogenesis; structure of sperm, oogenesis; structure of ovum; growth of ovarian follicles.

DESIRABLE TO KNOW:

Sperm in the male genital tract; sperm in the female genital tract; activation and capacitation of sperm ovum in the female genital tract; events of uterine and ovarian cycles.

(FIRST WEEK OF DEVELOPMENT)

MUST KNOW:

Definition; process of fertilisation - approximation, contact and fusion of gametes (sperm and ovum); formation of zygote; cleavage division; formation of morula; formation of blastocyst; site of implantation; formation of decidua - its subdivisions.

DESIRABLE TO KNOW:

Results of fertilisation; state of endometrium - preimplantation changes of endometrium; in vitro fertilisation; types of implantation; abnormal sites of implantation.

(SECOND WEEK OF DEVELOPMENT)

MUST KNOW:

Differentiation of embryoblast and trophoblast; changes in the embryoblast - bilaminar germ disc; changes in the trophoblast; formations of cytotrophoblast, syncytiotrophoblast, amniotic membrane, yolk sac, extra embryonic mesoderm and extra embryonic coelom and connecting stalk; formation of chorion, amniotic cavity, primary yolk sac cavity; appearance of prochordal plate.

(THIRD WEEK OF DEVELOPMENT)

MUST KNOW:

Appearance of primitive streak and primitive node; formation of intraembryonic mesoderm resulting in a trilaminar germ disc; formation of notochord; formation of buccopharyngeal and cloacal membranes; formation of pericardial bar; formation of paraxial, intermediate and lateral plate mesoderm and formation of secondary yolk sac, intraembryonic coelom; formation of allantoic diverticulum; derivatives of ectoderm, endoderm and mesoderm.

DESIRABLE TO KNOW:

Formation of nerorenteric canal.

(FOURTH TO EIGHTH WEEK OF DEVELOPMENT)

MUST KNOW:

Formation of somites; formation of neural tubes; cephalocaudal folding; lateral foldings; formation of a cylindrical body, stomadeum, proectodeum, gut and vitelline duct; subdivisions of gut into foregut, midgut and hindgut.

DESIRABLE TO KNOW:

Reversal of structures, ducts, head fold and tail fold; changes in external body form to human appearance.

(THIRD TO TENTH MONTH OF DEVELOPMENT)

MUST KNOW:

Maturation of tissues and organs and rapid growth of body.

DESIRABLE TO KNOW:

Estimation of age; horizons of development.

(PLACENTA)

MUST KNOW:

Formation of placenta- decidua basalis - formation of chorionic villi - formation of chorion frondosum - formation of chorion laeve; features of placenta; placental circulation; functions of placenta.

DESIRABLE TO KNOW:

Abnormalities; placental barrier; ultrastructural features; types of placenta.

(UMBILICAL CORD)

MUST KNOW:

Formation of umbilical cord; features of umbilical cord.

DESIRABLE TO KNOW:

Abnormalities.

(AMNIOTIC CAVITY)

MUST KNOW:

Amniotic cavity and membrane; amniotic fluid - functions; expansions of amniotic cavity and fusion with chorion; chorion laeve with decidua capsularis; decidua capsularis with parietalis; obliteration of chorionic and uterine cavities; function of fused foetal membranes to dilate cervical canal.

DESIRABLE TO KNOW:

Abnormalities; obliteration of chorionic and uterine cavities; abnormalities of chorion.

MUST KNOW: Formation of twins: types.

DESIRABLE TO KNOW:

Arrangement of foetal membranes. Conjoined twins.

(TERATOLOGY)

MUST KNOW:

Genetical and environmental factors for congenital malformations.

DESIRABLE TO KNOW:

Mode of actions of teratogenes, critical periods.

12. SYSTEMIC EMBRYOLOGY

MUST KNOW:

Normal development of each system.

DESIRABLE TO KNOW:

Developmental abnormalities; pathogenesis of the anomalies.

MUST KNOW:

Development of the individual organs of digestive system, genital system, urinary system, respiratory system, cardiovascular system, nervous system and special sensory organs and endocrine glands and mammary gland.

DESIRABLE TO KNOW:

Development of skeletal system, muscular system and derivatives of coelemic cavities.

MUST KNOW:

Formation of the congenital anomalies of various organs.

DESIRABLE TO KNOW:

Pathogenesis of the anomalies.

MUST KNOW:

Development of face and the pharyngeal arches and the associated congenital anomalies.

DESIRABLE TO KNOW:

Development of lymphatic system; development of the integumentary system.

13. SPECIAL SENSORY ORGANS

MUST KNOW:

Gross Anatomy and Micro Anatomy of eyeball, ear, nose, skin and tongue.

DESIRABLE TO KNOW:

Anatomy of the various nerve tracts and pathways concerned with these five sensory organs.

14. LYMPHATIC SYSTEM

MUST KNOW:

Gross anatomy of the different groups of the lymphnodes of the body and structures drained by each group. Gross anatomy of the major lymphatics specially about thoracic duct and its tributaries.

15. MICRO ANATOMY

MUST KNOW:

General Histology. Study of the basic tissues of the body.

DESIRABLE TO KNOW:

Functional correlation of the structural components of the organs.

MUST KNOW:

Systemic Histology. Structure of the organs of the various systems. To identify the structural components of the above after haematoxylin and eosin staining under compound light microscope. Electron microscopy of glomerulus. To stain the given tissue or organ of paraffin section with H&E and identify the features of the same.

DESIRABLE TO KNOW:

Identification of the cellular components in an electron micrograph.

16. MEDICAL GENETICS

MUST KNOW:

Clinical Genetics. Pedigree charting, dermatoglyphics, buccal smear, Down's syndrome, Klinefeller syndrome, Turner syndrome, genetic markers.

DESIRABLE TO KNOW:

Genetic counselling. Population genetics. Practical genetics.

17. POSTNATAL GROWTH AND DEVELOPMENT

MUST KNOW:

Meaning of the terms like growth, development etc.; principles of growth and development; types of postnatal growth, periods of growth and development and factors influencing them. Assessment of growth and development.

DESIRABLE TO KNOW:

Milestones of development. Growth and development during adolescence.

18. RADIOLOGICAL ANATOMY

MUST KNOW:

Identification of normal anatomical features in skiagrams.

DESIRABLE TO KNOW:

Identification of the normal anatomical features in special investigations.

19. SURFACE ANATOMY

MUST KNOW:

Study of the surface features of the body and projection of the outline of heart, lungs, pleura and important blood vessels and nerves.

DESIRABLE TO KNOW:

Location of the various arterial pulses in the living.

20. SECTIONAL ANATOMY

MUST KNOW:

Anatomical features at the following vertebral levels - transverse section cervical 5&7, Thoracic T2, T4, T7, T10, T12. Lumbar 1,5. Sacral 3.

DESIRABLE TO KNOW:

Median sagittal section of head and neck; median sagittal section of brain; horizontal section of brain at the level of IVth ventricle foramen. Coronal section of cerebrum at the level of the central sulcus and splenium.

SKILLS

1. Location of arterial pulses of the superficial temporal artery, common carotid artery, axillary artery, brachial artery, radial artery, femoral artery, popliteal artery, posterior tibial artery and dorsalis pedis artery.

2. Palpation/location of great auricular nerve, ulnar nerve and common peroneal nerve.

3. Palpation and identification of the bony prominences around shoulder, elbow, wrist, hip, knee and ankle.

4. H & E staining of paraffin sections.

5. Buccal smear examination for sex chromatin.

6. Identification of normal and abnormal Karyotyping.

7. Identification/location of internal jugular vein, median cubital vein, dorsal venous arch of hand, great saphenous vein, small saphenous vein and dorsal venous arch of foot.

8. Location and surface anatomy of scrotal part of vas deferens, lungs, heart, liver, spleen and kidneys.

9. Identification of the structures in exposed parts of the eyeball, nose and oral cavity.

AREAS FOR INTEGRATED TEACHING

Sl. No.	Area/Subject	Collaborating departments
1.	Anatomical basis of birth control measures	Obstetrics & Gynaecology, Community Medicine & Surgery
2.	Postnatal growth and development	Paediatrics and Community Medicine
3.	Antenatal growth and development	Obstetrics & Gynaecology
4.	Genetic disorders	Various clinical departments
5.	Medical genetics	Biochemistry
6.	Neuro-anatomy	Physiology
7.	Sex differences and age changes in bones	Forensic Medicine
8.	Normal and abnormal cells (cytology)	Pathology
9.	Anatomy of some important and common clinical syndromes	Various clinical departments
10.	Kinesiology - Movements at various joints	Orthopaedics
11.	Embryological basis of important and common congenital anomalies	Pediatrics and Obstet & Gynaecology

PHYSIOLOGY

DEPARTMENTAL OBJECTIVES

At the end of training in Physiology, the student should be able to:

1.1 describe normal functions, their physio-chemical principles and the regulatory mechanism of the various organs and systems of the body.

1.2 apply those principles in understanding the maintenance of constancy of internal environment (Homeostasis).

1.3 analyse the physiological responses under different environmental stresses such as heat, cold, low and high atmospheric pressures, ionising radiations and industrial pollutants.

1.4 correlate knowledge of physiology of human reproductive system in relation to National Family Welfare Programme.

1.5 correlate physiological functions with the disease processes and apply these principles to diagnosis and management of diseases.

1.6 develop intellectual skills in self learning and problem solving and to continue to learn the advances in the subject and to apply the same in relevant medical practice as and when warranted.

1.7 integrate and coordinate knowledge in other disciplines with that in Physiology.

2. demonstrate the habit of making careful and exact observations and skill in performing purposeful experiments for elucidation of various physiological phenomena.

3. develop proper attitudes and reactions in understanding the importance of physiological experiments and investigations.

COURSE CONTENT

1. GENERAL PHYSIOLOGY

MUST KNOW:

Homeostasis, concepts of physiological norms, range and variations, active passive transports, Relationship between stimulus and response.

DESIRABLE TO KNOW:

Inexubrane channels.

2. CELL AND FUNCTIONS

MUST KNOW:

Structure of cell membrane, resting membrane potentials, cellular receptors intercellular communications.

DESIRABLE TO KNOW:

Cell inclusions, their functions.

3. BODY FLUIDS, BLOOD

MUST KNOW:

Blood: Composition, principles of estimation, functions of plasma proteins, cellular elements of blood, their formation and regulation, haemoglobin and functions, jaundice, anaemias and their classification, haemostatic mechanisms, blood groups, Rh incompatibility, anticoagulants, blood transfusion and ESR, basic mechanisms of immunity with respect to lymphocytes and functions of WBCs, lymph.

DESIRABLE TO KNOW:

Changes in body fluids in disease, oedema. Hypo-proteinaemia. Replacement of body fluid loss. Functions of thymus. Structure of immunoglobulins · Autoimmunity, effects of lymphatic obstruction, AIDS.

4. NERVE AND MUSCLE

MUST KNOW:

Classification, structure of nerve and muscles. Electrical, mechanical properties. Mechanism of muscle contraction and its molecular basis.

Neuromuscular tranmission, thermal changes, oxygen debt, mechanical efficiency. Smooth muscle - electrical and mechanical properties, nerve supply, neuro-transmitters, Wallerian degeneration.

DESIRABLE TO KNOW:

Effects of denervation on muscle neuromuscular disorders, investigations for nerve and muscle disorders, details of chemical changes in muscle contraction. EMG.

5. GASTROINTESTINAL TRACT

MUST KNOW:

Functional morphology, functions, regulation of secretion of salivary glands, stomach, small intestine and large intestine, regulation of gastrointestinal motility, functions of gall bladder, liver, site of production and action of G.I. hormones, physiological basis of investigating disorders of secretion and motility.

DESIRABLE TO KNOW:

Effects of disorders of secretion and motility. Physiological basis of peptic ulcer and achalasia, motility disorders, liver function tests, diarrhoea and its treatment.

6. KIDNEY

MUST KNOW:

Structure and functions of different parts of nephron in urine formation. Role of kidney in water and electrolyte balance. Acidification of urine, diuresis, kidney function tests. Juxtaglomerular apparatus, Renin-Angiotensin system. Renal blood flow, structure and innervation - micturition, cystometrogram.

DESIRABLE TO KNOW:

Mechanism of action of diuretics, renal failure, principles of artificial kidney, disorders of micturition.

7. SKIN AND BODY TEMPERATURE

MUST KNOW:

Functional morphology, heat gain and loss mechanisms, role of skin in temperature regulation. Body temperature, normal values and variations.

DESIRABLE TO KNOW:

Hyperthermia, fever, heat stroke, cold injury.

8. ENDOCRINE GLANDS

MUST KNOW:

General principles in regulation of endocrine glands. Hormones - function regulation. Experimental and clinical disorders of anterior and poster pituitary, thyroid, parathyroid, adrenal cortex, adrenal medulla and endocri pancreas. Stress and hormones. Physiology of growth. Investigations.

DESIRABLE TO KNOW:

Synthesis and transport of hormones, receptors and blockers. Functions of loc hormones - pineal, cellular mechanism of hormonal action.

9. REPRODUCTION

MUST KNOW:

Spermatogenesis, regulation, functions of testis, constituents of semen ejaculation, testicular hormones, puberty.

Critical changes in ovary, uterus, cervical mucus, vagina in menstrual cycle Hormonal regulation. Ovulation and its detection, fertilisation, implantation physiological changes during pregnancy, parturition, placenta, Physiology o lactation, menopause.

Physiological basis of contraception in males and females, principles of use o oral contraceptives, safe period, rhythm and other methods of contraception.

DESIRABLE TO KNOW:

Biochemistry of semen, abnormalities of testicular function, sex determinatio and differentiation.

Foetoplacental unit, composition of milk, colostrum, nutritional needs of mothe and child during pregnancy and lactation, investigations for fertility.

10. CARDIOVASCULAR SYSTEM

MUST KNOW:

Heart: Functional anatomy of heart, properties of cardiac muscle activity, electrical and mechanical changes in cardiac cycle, normal ECG. Cardiac output: measurement in man, physiological variations, regulatory mechanisms of

heart rate, cardiac output and blood pressure. Regional circulations: coronary, cerebral, skin and foetal - normal values, measurement of and regulation. Changes in CVS during muscular exercise, hypovolemia, postural changes, gravitational forces,hypoxia and cardiomulmonary resuscitation.

DESIRABLE TO KNOW:

Principles of electrocardiography and cardiac catheterisation. Arrhythmias, pathophysiology of cardiac failure, hypertension, valvular disorders.

11. RESPIRATORY SYSTEM

MUST KNOW:

Functional anatomy of respiratory system. Mechanics of normal respiration. Lung compliance. Alveolar ventilation, ventilation perfusion ratio. Diffusing capacity. Pulmonary function tests. Oxygen and carbon dioxide transport. Regulation of respiration. Hypoxia, cyanosis, asphyxia. Respiratory adjustments during muscular exercise, hypoxic, hyperbaric conditions, principles of oxygen therapy, artificial respiration, pulmonary blood flow measurement.

DESIRABLE TO KNOW:

Hyaline membrane disease. Pathophysiology of obstructive and restrictive disorders. Pulmonary oedema, decompression sickness, hyperbaric oxygen therapy, respiratory acidosis and alkalosis, dyspnoea.

12. CENTRAL NERVOUS SYSTEM

MUST KNOW:

Organisation of central nervous system. Functions and neuronal organisation at the spinal cord level. Synaptic transmission. Motor and sensory systems and their lesions. Reticular system in brain stem, sleep, wakefulness, EEG waves and physiological changes in EEG. Clinical lesions and experimental sections at spinal cord, brainstem and sub-cortical levels. Physiology of basal ganglia, cerebellum, thalamus, hypothalamus, limbic system, prefrontal lobe and cerebral cortex. Speech and its disorders. Autonomic nervous system, formation and functions of CSF. Neurotransmitters of various levels and functions. Blood brain barrier.

DESIRABLE TO KNOW:

Evoked potentials, desynchronising and synchronising mechanism of EEG, autonomic pharmacology, hemispheric specialisation, syringomyelia, tabes dorsalis, disorders of CSF formation and circulation, memory disorders, recent neurotransmitters.

13. SPECIAL SENSES

EYE

MUST KNOW:

Image formation on retina by various refractory media. Errors of refractio functions of aqueous humour, intra-ocular tension. Mechanisms o accommodation, dark adaptation, pupilary reflexes, functions of retina, role o visual cortex in perception, optic pathway and lesions. Field of vision. Colou vision. Movement of eyeballs.

DESIRABLE TO KNOW:

Structure of photoreceptors, generator potentials of rods and cone Electroretinogram, organisation of lateral geniculate body, neurotransmitters i retina.

AUDITORY APPARATUS

MUST KNOW:

Functions of tymphanic membrane, middle ear, cochlea, auditory receptors an its pathway. Deafness and its causes.

DESIRABLE TO KNOW:

Microphonic potentials, audiometry, theories of hearing, endocochlear potentia and their relation to hair cell stimulation.

VESTIBULAR APPARATUS

MUST KNOW:

Division, functions, connections and lesions, nystagmus.

DESIRABLE TO KNOW:

Tests of vestibular functions, nystagmus, mechanism of habituation.

TASTE AND SMELL

MUST KNOW:

Receptor, pathways and cortical and limbic areas associated with taste and smell

DESIRABLE TO KNOW:

Disorders of taste and smell perception.

COURSE CONTENT (PRACTICALS)

The following list of experiments and demonstrations is not exhaustive, additional experiments can be included as and when feasible and required.

1. HAEMATOLOGY

MUST KNOW:

Principles of microscopy and method of using microscope; general examination of blood under microscope; enumeration of red blood cells; enumeration of while blood cells; eosinophil count; preparation and staining of blood films; identification of blood cells in a stained film; differential leucocyte count; specific gravity of blood; fragility of red blood cell; erythrocyte sedimentation rate, haematocrit value; blood grouping; estimation of haemoglobin; laboratory classification of anaemias and determination of absolute indices like MCH, MCHC, MCV, colour index; bleeding and clotting time.

DESIRABLE TO KNOW:

Methods of blood collection; Arneth count; enumeration of reticulocyte and platelets (demonstration); viscocity of blood (demonstration); blood volume estimation (demonstration); bone marrow smear (demonstration).

2. NEURO-MUSCULAR PHYSIOLOGY

MUST KNOW: Human:

Mosso's ergography; effects of prolonged voluntary activity, rest, motivation, fatigue on human muscle contractions and calculation of work done; bicycle ergometry and treadmill, mechanical efficiency of human body.

DESIRABLE TO KNOW:

Demonstration of electromyography; velocity of nerve impulse and strength duration curve in humans (demonstration); Compound action potential (demonstration).

2.1 EXPERIMENTAL MUSCULAR PHYSIOLOGY

DESIRABLE TO KNOW:

Study of laboratory appliances in experimental physiology and dissection of frog's gastrocnemius - sciatic muscle nerve preparation; simple muscle curve; effects of increasing strength of stimuli; effects of temperature; genesis of fatigue; effects of two successive stimuli; genesis of tetanus; effect of after load and free load on muscle contraction and calculation of work done; velocity of

nerve impulse in sciatic nerve of the frog; isometric contraction an determination of resting length.

2.2. SMOOTH MUSCLE EXPERIMENTS

DESIRABLE TO KNOW:

Recording of contraction of frog's rectum; recording of movements of sma intestine (rabbit) and effects of ions, drugs, temperature.

3. EXPERIMENTS ON METABOLISM, BODY TEMPERATURE AND KIDNEY

MUST KNOW:

Recording of body temperature and effects of exercise on body temperature.

DESIRABLE TO KNOW:

Basal metabolic rate in humans; water excretion test.

4. EXPERIMENTS ON ENDOCRINES AND REPRODUCTIVE SYSTEM

DESIRABLE TO KNOW:

Demonstration of vaginal smears of rats; identification of the phases of the estru cycle; pregnancy diagnostic tests; effects of adrenaline, posterior pituitar extract on uterine muscle; examination of semen - sperm count, sperm motilit (demonstration); Demonstration of slides showing the proliferative and secretor changes in the endometrium.

5. CARDIOVASCULAR SYSTEM

MUST KNOW:

Clinical examination of cardiovascular system; sphygmomanometry: exercise or blood pressure; effect of posture and exercise on B.P.; radial pulse cold-presso test; Electrocardiography.

DESIRABLE TO KNOW:

Experimental cardiogram: effect of warmth and cold on sinus venosus and ventricle; extra systole and compensatory pause; stannius ligatures; properties of cardiac muscle; effect of acetylcholine, adrenaline, nicotine and atropine on frog heart; perfusion of blood vessels of frog; perfusion of mammalian heart and effect of drugs on it; perfusion of frog's heart and effect of ions on it.

Demonstrations: Echocardiography; cardiac output in dogs; record of blood pressure, venous pressure, repiration in animals (dog) and effects of various factors on it; phonocardiogram; effect of passive tilt on B.P.; effect of exercise on hemo-cardio-respiratory system; Cardiac function tests; Cutaneous circulation in man.

6. RESPIRATORY SYSTEM

MUST KNOW:

Pulmonary function tests including spirometry; clinical examinations of respiratory system; stethography; cardiopulmonary resuscitation; respiratory response to exercise.

DESIRABLE TO KNOW:

Demonstrations: Compliance and surfactant; Donder's model to demonstrate the mechanism of respiration; Dog/cat: intrapleural and intraoesophageal pressures and the effect of various influences on them; Muller's manoeuver; Collection and analysis of respiratory gases; uses of Douglas bag.

7. NERVOUS SYSTEM

MUST KNOW:

Examination of motor functions, sensory functions and cranial nerves examination; examination of reflexes of normal subject.

DESIRABLE TO KNOW:

Demonstrations: E.E.G., E.M.G., and nerve conduction studies: sensory, motor, compound action potential; decerebrate rigidity in cat; reaction time; spinal frog and reciprocal innervation; decerebrate frog; examination of autonomic functions.

8. SPECIAL SENSES

MUST KNOW:

To study the model of eye; perimetry; acuity of vision - distant and near; colour vision; tests on smell and taste; tuning fork tests.

DESIRABLE TO KNOW:

Demonstrations: Principles of ophthalmoscopy and retinoscopy; audiometry; Purkinje-Samson images.

AREAS FOR INTEGRATED TEACHING

Sl.No.	Area	Collaborating Departments
1.	Endocrine glands	Biochemistry and Medicine
2.	Family Planning and Welfare	Anatomy and Obstetrics & Gynaecology
3.	Echocardiography	Cardiology
4.	Basic life support (module)	Anaesthesiology and Anatomy
5.	Patho-physiology of hypertension	Medicine
6.	Intraocular tension and retinoscopy	Ophthalmology
7.	Audiometry and vestibular tests	Oto-rhino-laryngology (ENT)

BIOCHEMISTRY

EPARTMENTAL OBJECTIVES

At the end of the learning period of one year in Biochemistry, the student all be able to:

state the gross biochemical functions of the various systems of the human body.

recognise and state the correlation of the anatomical and physiological features of the human body with biochemical functions.

state the biochemical basis for the normal and abnormal functioning of the human body.

point out the nature of biochemical defects in various disease states commonly encountered in clinical practice.

apply the biochemical knowledge so acquired in the practice of medical sciences.

continue to learn advancements in biochemistry and apply the same in medical practice as and when warranted.

develop an attitude to arrive at a provisional diagnosis of various biochemical disorders that can be encountered in clinical practice and motivate the affected persons in the community for proper management on the basis of the biochemical knowledge so acquired.

to perform qualitative and quantitative analysis of substances of biochemical importance in the human system and interpret the results.

COURSE CONTENT

1. EUKARYOTIC CELL STRUCTURE

MUST KNOW:

Cellular compartments - cellular environment - organisation and composition eukaryotic cells, functional role of subcellular organelles and membranes.

2. CARBOHYDRATE CHEMISTRY

MUST KNOW:

Definition, classification and nomenclature of carbohydrates, structure glucose, biological importance and properties of glucose, fructose,. galactos lactose, maltose, sucrose, ribose starch, insulin, glycogen, aminosugars, deo sugars, heteropolysaccharides, carbohydrates of cell membranes.

DESIRABLE TO KNOW:

Sialic acids, blood group substances.

3. LIPID CHEMISTRY

MUST KNOW:

Definition, classification, nomenclature of lipids, biological importance a properties of saturated and unsaturated fatty acids, triacylglycero phospholipids, glycerol, sterols, steroids, glycolipids, prostaglandin leukotrienes, thromboxanes, iodine number, rancidity.

DESIRABLE TO KNOW:

Structure and functions of biological membrane, liposomes.

4. PROTEIN CHEMISTRY

MUST KNOW:

Definition, classification, composition of proteins, aminoacids, the classification and properties, protonic equilibria of amino acids, separato techniques for amino acids and proteins - biologically important small peptide conformation of proteins - levels of structural organisation.

DESIRABLE TO KNOW: Structure of amino acids.

5. STRUCTURE-FUNCTION RELATIONSHIP OF PROTEINS

UST KNOW:

Oxygen transport proteins - myoglobin structure and function - structural basis of physiological functions of hemoglobin - co-operative binding, Bohr effect, role of 2,3 Diphosphoglycerate, fetal haemoglobin, modification of Hb structure and disease-glycated haemoglobin, HbM, HbC, Thalassemias, HbS.

Collagen structure and function; Lipoprotein - structural characteristics, classification and biological importance.

Structure and functions of immunoglobulins.

6. NUCLEIC ACIDS

UST KNOW:

Definition, structural description and functions of nucleic acids, their constituents and derivatives in our body. Biologically important nucleotides and their significance - synthetic analogues of purines and pyrimidines of medical importance.

a) **Enzymes:** General characteristics of enzymes, enzyme nomenclature, mechanism of enzyme catalysis, enzyme kinetics, enzyme inhibition, organisation of multienzyme systems, regulation of enzyme activity in vivo, factors influencing enzyme activity, clinical enzymology.

b) **Co-enzymes:** Definition, concepts of cosubstrate, second substrate, role of co-enzymes in group transfer reactions, classification and biological significance.

c) **Vitamins:** Definition, classification, occurence, sources, daily requirements, functions, deficiency manifestation, A, D, E, K, Thiamin, Riboflavin, Niacin, Pantothemic acid, Biotin, Folic acid, Cyanocobalamin, Pyridoxin, PABA and antivitamins, hypervitaminosis.

ESIRABLE TO KNOW:

Isolation, nomenclature and regulation of enzyme activity. Structure of co-enzymes. Structure of vitamins and antivitamins; free radicals; lipid perioxidation and overview of anti-oxidants.

7. DIGESTION AND ABSORPTION

UST KNOW:

Mechanism of digestion and absorption in gastrointestinal tract of carbohydrates, lipids, proteins, aminoacids, vitamins, factors influencing digestion and absorption, role of dietary fibre.

DESIRABLE TO KNOW:

Alterations in mechanisms of digestion and absorption leading on to disea process.

8. INTRODUCTION TO INTERMEDIARY METABOLISM

MUST KNOW:

Definition, bioenergetics - solid state, entrophy, free energy (G), coupled rea tion, high energy (P) compounds, oxidation-reduction reactions - definitio redox potential, electron carriers, compartmentalisation of metabolic pathways i cells and the biologic advantage of such compartmentalisation.

Stages of catabolism of molecules:

i) breakdown with no energy trap

ii) breakdown with some force energy trap

iii) final pathway CMP consisting of TCA, electron transport chain and oxidative phosphoxylation.

Phosphorylation at the substrate level; mitochondrial electron transport an oxidative phosphorylation. Description, localisation, organisation of electro transport and uncouplers of oxidative phosphorylation, basic concepts o mechanism of oxidative phosphorylation.

a) **Carbohydrates (without stress on structures):** An overview an regulatory steps of glycolysis, glycogenesis, glycogenolysis, gluconeogenesis HMP shunt, uric acid pathway, interconversion of hexoses, metabolism o fructose and glactose, blood glucose homeostasis, overview of commo disorders of carbohydrate metabolism and their clinical significance, diabete mellitus and relevant biochemical investigations, oral glucose tolerance test.

b) **Lipids:** Overview of fatty acid synthesis, oxidation, ketosis, fatty liver cholesterogenesis, biochemical basis of arteriosclerosis, hyperlipoproteinemias obesity, role of adipose tissue. Lipotropic factors and hypolipidemic drugs Metabolic rate of cholesterol.

c) **Proteins and amino acids:** Basic concepts of disposal of nitrogen transamination, deamination, urea cycle, overview of disposal of carbon skeleto of amino acids, formation and biological significance of special compounds from amino acids - glycine tryptophan, tyrosine, phenylamanine, histidine, sulphur containing amino acids. Common inborn errors of amino acid metabolism.

d) Integration of metabolism of carbohydrates, lipids and amino acids, common metabolic pathway (TCA cycle).

e) **Neucleotides, purines and pyrimidines:** Origin of constituents in the formation of purines, pyridimines and nucleotides, regulatory influences, breakdown of purine and pyridimines, biochemical basis and laboratory diagnosis of gout.

f) **Minerals:** Sources, daily requirements, absorption, biochemical functions and deficiency manifestations of calcium, phosphorus, iron, fluoride, magnesium, copper, zinc, iodine, sodium, potassium and chloride.

g) **Energy and nutrition:** Calorie requirements, qualitative and quantitative requirements, specific dynamic action, BMR, factors influencing BMR, respiratory quotient, biological value of proteins, formulation and computation of energy requirements for a medical student, balanced and adequate diets, formulation of diets in health and diseases, protein and protein energy malnutrition, obesity, starvation.

h) Outline of detoxication mechanisms in human body.

DESIRABLE TO KNOW:

Free radicals, lipid peroxidation; Methods of investigations of intermediary metabolism; detailed aspects of metabolism of carbohydrates, rare disorders related to metabolism including glycogen storage disease; Detailed steps involved in the synthesis of triacylglycerols, phospholipids, lipoproteins, prostaglandins, leucotriene and thromboxanes. Rare disorders related to lipid metabolism; Detailed steps in the breakdown of amino acids and rare inherited disorders related to amino acid metabolism; Purine salvage pathways secondary hyperuricemia; Metabolism of chromium, cobalt, selinium etc. toxicity manifestations; Food toxins and additives; adulteration of foods, nutrification and fortification of foods; Basic concepts of total parenteral nutrition.

v) <u>Composition and formation of urine, normal and abnormal</u>:

MUST KNOW:

a) Constituents in urine, renal function tests, concept of clearance tests.

b) Regulation of fluid and electrolyte balance, disorders associated with laboratory parameters in diagnosis of fluid and electrolyte disorders. Oral rehydration solution.

c) Acid base balance, blood buffers, regulation of blood pH, role of erythrocytes, lungs and kidneys in regulation of acid base balance, acidosis, alkalosis of respiratory and non-respiratory origin, laboratory parameters in diagnosis of acid base disorders.

d) Breakdown of hemoglobin, biochemical basis of jaundice, classification and their importance, bile pigments and their importance; overview of biochemical basis of porphyrias, hepato-biliary function tests.

e) Gastric and pancreatic function tests and laboratory diagnosis common gastric and pancreatic disorders.

f) Thyroid function tests.

g) Endocrinology: Mechanism of action and metabolic role hormones.

h) Biochemical changes in pregnancy, metabolic requirements duri pregnancy, biochemical basis of contraception.

DESIRABLE TO KNOW:

Synthesis of hemoglobin, its enzymatic control, detailed knowledge of porphy ias; Role of radio isotopes in Medicine; Fetoplacental unit; biochemical tests fetal maturity and abnormalities.

v) **Immunology and Molecular Biology:**

MUST KNOW:

a) Basic biochemical concepts of immunology.

b) Overview of cell cycle, DNA replication, transcription and protei biosynthesis, mutations, general principles of recombinent DN technology and its practical applications in medicine. Outline biochemical basis of carcinogenesis.

DESIRABLE TO KNOW:

Immunodiagnostic methods; Regulation of genetic expression in eukaryotes Inhibitors of protein synthesis, post translational modifications, DNA damag and repair mechanisms, blotting techniques; gene therapy.

PRACTICALS

1. Spectroscopic examination of haemoglobin and derivatives.
2. Qualitative analysis of gastric juice and bile; principle of Vandenberg test. Inter pretation of gastric analysis with correlation to diseases.
3. Qualitative analysis of milk and common food stuffs.
4. Qualitative analysis of normal and abnormal constituents of urine and interpret tion of results of such analysis.
5. Principles of colorimetry.

Sl.No.

1.

2.

6. Princip urea, cr
7. Princip results.
8. Princip of a chr
9. Princip

Principles of estimation and interpretation of results of estimation of glucose, urea, creatinine, proteins, bilirubins, calcium, cholesterol in blood.

Principles of estimation of urea, creatinine in urine and the interpretation of results.

Principles of chromatographic and electrophoretic techniques and interpretation of a chromatogram and electrophoretic pattern of serum proteins.

Principles of radioactive tracer techniques.

AREAS FOR INTEGRATED TEACHING

Sl No.	Area	Collaborating Departments
1.	Medical Genetics	Anatomy
2.	Endocrine glands	Physiology & Medicine

ANATOMY

EXAMINATION SCHEME

A. **INTERNAL ASSESSMENT:** 40 marks

(Notified test: 30 marks
Records: 10 marks)

Notified tests are being conducted periodically with regular intervals and the average of best 3 test performances are taken into account for 30 marks of internal assessment.

Histology record and Gross Anatomy record are being maintained by the students and 10 (5+5) marks are awarded for the same.

The pre-University or ~~Send-up~~ examination marks are also taken into account for computing internal assessment. Minimum 4 notified tests are being conducted.

B. **UNIVERSITY EXAMINATION:**

I. **Written Examination**: Time: 3 hours; Total marks: 80.

a) **Types of questions and allocation of marks for each:**

	Recall type	Understanding type	Application type
Long answers (10 marks)	10x2 = 20	--	--
Short answers(3 marks)	3x2 = 6	3x4 = 12	3x4 = 12
Very short answers (2 marks)	2x7 = 14	2x4 = 8	2x4 = 8

b) **Allocation of marks for each sub-division of the course contents:**

PART - I

1.	General anatomy, general histology, general embryology	-	10 marks
2.	Medical genetics	-	10 marks
3.	Upper limb	-	10 marks
4.	Lower limb	-	10 marks
5.	Abdomen and pelvis, concerned embryology and histology and anatomical basis of birth control and family welfare measures	-	40 marks

The question paper should have four sections called Section I, II, III, IV and each section shall be answered in separate answer book. Each section is to be evaluated by one examiner.

(Total 4 examiners - one section for each).

Allocation of subjects in various sections:

Section - I - Item No.5 and 3
Section - II - Item No.5 and 1
Section - III - Item No.5 and 4
Section - IV - Item No.5 and 2

PART - II

1.	Thorax: concerned histology and embryology	-	20 marks
2.	Neuro anatomy: concerned histology and embryology	-	20 marks
3.	Head and neck: concerned histology and embryology	-	30 marks
4.	Postnatal growth and development	-	10 marks
			80 marks

Allocation of subjects in various sections:

Section - I - Thorax
Section - II - Neuro anatomy
Section - III - Head and neck
Section - IV - Head and neck and Postnatal growth and development

The model question papers have been provided.

II. **Oral Examination:** 40 marks

Osteology	-	10 marks
Embryology	-	10 marks
Surface anatomy	-	10 marks
Radiological anatomy	-	10 marks

III. **Practical Examination:** 40 marks

Gross Anatomy practical: 20 marks

Part I: Limbs - 10 marks
Abdomen and pelvis - 10 marks

Part II: Neuro anatomy and thorax - 10 marks
Head and neck - 10 marks

For Gross Anatomy practical, the students are examined after providing the dissected specimens.

Histology practical: 20 marks
(Common to both Part I and Part II)

Histology spotters - 10 marks

Staining of paraffin section with H&E and identification, followed by discussion - 10 marks

100/200 is being considered for passing Anatomy in each Part-I and Part-II.

MODEL QUESTION PAPER IN ANATOMY

I M.B.B.S. EXAMINATION

FIRST SEMESTER - PART-I

Time: Three hours. Max. Marks: 80

Each section to be answered in separate answer book.
Illustrate the answer with suitable diagram.

SECTION I

			Marks
1.	Write briefly on:		
	a)	The role of serratus anterior muscle in abduction of arm	3
	b)	The lymphatic drainage of female breast in respect of its role in malignancy of breast	3
2.	Briefly explain why		
	a)	in infection of palm there is swelling on the dorsum of hand	2
	b)	injury to ulnar nerve behind the medial epicondyle of humerus causes flattening of hypothenar exminence and prominence of metacarpal bones	2
3.	Describe the gross anatomy and histology of pancreas.		7+3 = 10

SECTION II

4.	Write briefly on:		
	a)	Role of arterial anastomosis	3
	b)	Structure and functions of three types of simple columnar epithelial cells	3
	c)	Difference between monozygotic and dizygotic twins	2
	d)	Functions of articular discs of synovial joints.	2
5.	Briefly explain:		
	a)	Formation of congenital polycystic kidney	2
	b)	Applied anatomy of lobes of prostate with reference to structure and relations	3

c) Applied anatomy of hepato renal pouch with reference to boundaries and relations 2

d) Obstruction to inferior venacava causing prominence of veins of anterolateral abdominal wall 3

SECTION - III

6. Describe the boundaries and list the contents of the perineal pouches in both the sexes 5+5 = 10

7. Write briefly on:

a) Mechanism of formation of varicose veins in lower limb. 3

b) Effects of injury to common peroneal nerve at the level of neck of fibula 3

c) Role of popliteus muscle in movements of knee joint 2

d) Blood supply to neck of femur 2

SECTION - IV

8. Write briefly on:

a) Theory of dosage compensation 3

b) Physical and chromosomal defects in Cri-du-Chat syndrome 3

c) Mendel's First Law 2

d) Genetic markers 2

9. Explain briefly:

a) Formation and features of Meekel's Diverticulum 2

b) Course and relations of Vas Deferens with reference to contraception 2

c) Anomalies of uterus with reference to sterility 2

d) Formation of ectopic testis 2

e) Why right gonadal vein drains into inferior venacava while left gonada vein drains into left renal vein 2

MODEL QUESTION PAPER IN ANATOMY

I M.B.B.S. EXAMINATION

SECOND SEMESTER - PART-II

(Head and Neck, Thorax, Neuro Anatomy, Histology, Embryology, Postnatal Growth and Development)

Time: Three hours. Max. Marks: 80

Each section to be answered in separate answer book.
Illustrate answers with suitable diagrams where necessary.

SECTION - I

Marks

1. Explain briefly why/how

   a) Collateral circulation will be established when superior vena cava is obstructed *above* the entrance of the azygos vein. 3

   b) Atrial septal defect occurs. 3

   c) An inhaled foreign body is more likely to pass down the right bronchus. 2

   d) The left recurrent laryngeal nerve hooks round the ligamentum arteriosum. 2

2. What is the origin of the coronary arteries? Name the branches and area of supply of each of these arteries. 2+4+4 = 10

SECTION - II

3. a) Why do the facial nerve fibres go around abducent nerve nucleus? 3

   b) How is the Calcar Avis formed? Where is to be found? 3

   c) Why is the sensory cortex known as the granular cortex? 2

   d) Why are signs of motor dysfunction found on the same side of the body in the case of unilateral cerebellar hemisphere lesions? 3

   e) Why will the leg be affected if the anterior cerebral artery is ligated or cut? 2

   f) What is a commissure? Name the parts of the Corpus Callosum. 2

g) List the afferent and efferent connections of the following thalamic nuclei:

i) Ventrolateral (ventral intermediate)
ii) Ventral posterior lateral nucleus
iii) Medial geniculate body 3

h) What is the histological appearance of the posterior root ganglion? 2

SECTION - III

4. How is the tongue developed? What is its microscopic anatomy? What is its blood supply and nerve supply? 3+3+2+2 = 10

5. a) How is it that a pituitary tumour may cause bitemporal hemianopsia? 3

b) Why is the posterior crico-arytenoid muscle known as the most important single muscle in the larynx? 2

c) Draw and label a diagram showing a typical intercostal nerve. 3

d) What is meant by the mediastinum? How is it subdivided? 2

SECTION - IV

6. Give reasons why/how.

a) In surgical removal of the thyroid gland, the inferior thyroid artery is ligated or tied away from the gland. 2

b) Why damage to the stellate ganglion can result in ptosis or drooping of the eyelid. 3

c) Excessive bleeding may occur from the tonsillar fossa after removal of the palatine tonsil. 3

7. a) What is the effect of damage to the lingual nerve as it lies near the lower third molar tooth? 2

b) What changes take place in the respiratory system of the child after birth? 2

c) What are the stages in post natal growth? 2

d) What is the importance of the "Road to Health" card? 2

e) Write briefly on the eruption of the milk or deciduous teeth in the child. 2

f) How is the adult height reached from childhood? 2

PHYSIOLOGY

PHYSIOLOGY

EXAMINATION SCHEME

A. **INTERNAL ASSESSMENT:** .. 40 marks
(Notified test: 30 marks
Record : 10 marks)

B. **UNIVERSITY EXAMINATION:**

I.	Theory (Written)	.. 80 marks
II.	Oral	.. 40 marks
III.	Practical	.. 40 marks
	Total	.. 200 marks

INSTRUCTIONS TO PAPER SETTERS

Key: R = Recall type; I = Interpretation (understanding) type; A = Application type

Types of questions and allocation of marks and subjects for each section:

PART - I

SECTION - I

Q.1.	Essay - Physiology of blood	R : 2 I : 6		2+6 = 8
Q.2.	a) Blood	R : 2		
	b) General physiology/Body fluid	R : 2		
	c) -do-	I : 2		
	d) -do-	I : 2		
	e) -do-	A : 2		
	f) -do-	A : 2		2x6 = 12

SECTION - II

Q.3.	a) Muscle and Nerve	R : 4		
	b) -do-	I : 4		
	c) Kidney and Urinary bladder	I : 4		
	d) -do-	I : 4		
	e) -do-	I : 2 A : 2		4x5 = 20

SECTION - III

Q.4.	Essay - Physiology of Endocrines		R :	2		
			I :	6	2+6	= 8
Q.5.	a)	Endocrines	I :	2		
	b)	-do-	I :	2		
	c)	-do-	I :	2		
	d)	-do-	A :	2		
	e)	Male reproduction	I :	2		
	f)	Male reproduction	I :	2	2x6	= 12

SECTION - IV

Q.6.	a)	Physiology of G.I. tract	R :	4		
	b)	-do-	I :	4		
	c)	Reproduction female	I :	4		
	d)	-do-	R :	4		
	e)	-do-	A :	4	4x5	= 20

		Total marks				= 80

PART - II

SECTION - I

Q.1.	Essay - Cardiovascular system		R : 2 I : 6	2+6	= 8
Q.2.	a)	Cardiovascular system	R : 2		
	b)	-do-	R : 1 A : 1		
	c)	-do-	I : 2		
	d)	-do-	I : 2		
	e)	-do-	I : 2		
	f)	-do-	A : 2	2x6	= 12

SECTION - II

Q.3.	a)	Cardiovascular system	R : 2 I : 2		
	b)	Respiratory system	R : 2 I : 2		
	c)	-do-	R : 1 A : 3		
	d)	-do-	I : 4		
	e)	-do-	I : 4 I : 4	4x5	= 20

SECTION - III

Q.4.	Essay - Central Nervous System		R : 2 I : 6	2+6	= 8
Q.5.	a)	Central Nervous System	R : 2		
	b)	-do-	I : 2		
	c)	-do-	I : 2		
	d)	-do-	I : 2		
	e)	-do-	R : 1 A : 1		
	f)	-do-	A : 2	2x6	= 12

SECTION - IV

Q.6.	a)	Hypothalamus, limbic system, autonomic nervous system	I : 4		
	b)	Body temperature regulation Cerebrospinal fluid	R : 4		
	c)	Special senses	R : 1 A : 3		
	d)	-do-	I : 4		
	e)	-do-	I : 4	4x5	= 20
		Total marks			= 80

MODEL QUESTION PAPER IN PHYSIOLOGY

FIRST M.B.B.S. EXAMINATION

PART-I

Time: 3 hours. Max. marks: 100

Each Section to be answered in a separate answer book.
Illustrate the answer with suitable diagrams.

SECTION-I

Marks

1. Name two immediate precursors of erythrocytes. Describe how erythropoiesis and erythrocytes are altered by the following conditions:

   a) High altitude.
   b) Vit.B-12 deficiency (2+3+3) = 8

2a. Name any two anticoagulants and mention their mode of action. 2x6 = 12

b. Mention the normal values for sodium and potassium in extra-cellular and intracellular fluids.

c. Describe the effects of ouabain on sodium potassium pump and contractility.

d. Describe the immediate effect of intravenous hypertonic mannitol infusion on intracellular fluid compartment.

e. Describe the effect of lymphatic obstruction in a limb and explain.

f. Describe the effect of hyperkalaemia on resting membrane potentiality and excitability of a cell.

SECTION - II

3a. Draw and label a schematic diagram of neuromuscular junction of skeletal muscle. Name any two neuromuscular blocking agents. 4x5 = 20

b. Draw a schematic diagram of a sarcomere. Mention the role of calcium in contraction and relaxation of skeletal muscle.

c. Describe the role of physical factors that determine effective filtration pressure in the glomeruli. Describe how ureteric obstruction affects glomerular filtration.

d. Graphically correlate plasma concentration of glucose and insulin with their excretion in urine. Indicate the value of renal threshold for glucose in the graph.

e. In diabetes insipidum, the daily urine output is 20l in spite of a glomerular filtration of 180l. Explain the mechanism of reabsorption of water for the remaining 160l filtrate, indicating the sites.

SECTION - III

4. Name the hormones of posterior pituitary gland. Describe how their secretion is regulated. 2+6 = 8

5a. Mention the effects of iodine deficiency on thyroid gland. 2x6 = 12

b. Mention the effects of aldosterone on extracellular fluid volume.

c. Mention the effect of insulin deficiency on blood glucose level.

d. Describe the effect of deficiency of paratharmone on excitability of nerve.

e. Mention four effects of administration of testosterone in a 20 year old female.

f. Describe the difference between emission and ejaculation in male.

SECTION - IV

6a. What are the products secreted by parietal cells of stomach? Enumerate the endogenous substances which can directly stimulate the parietal cells. 4x5 = 20

b. Briefly explain the effect of fatty diet on the motor functions of stomach and gall bladder.

c. Draw a labeled diagram correlating endometrial changes with ovarian hormonal levels during a menstrual cycle.

d. Name four hormones acting on breast and mention their functions.

e. Describe the effect of oral contraceptives on ovulation.

MODEL QUESTION PAPER IN PHYSIOLOGY

FIRST M.B.B.S. EXAMINATION

PART-II

Time: 3 hours. Max.marks: 100

Each Section to be answered in a separate answer book.
Illustrate the answer with suitable diagrams.

SECTION-I

Marks

1. Define systolic, diastolic, mean and pulse pressures. Explain the changes in heart rate and blood pressure in the following conditions: 2+3+3 = 8

   a. Moderate exercise
   b. Rising from recumbent to erect position.

2a. Draw ECG as obtained in standard limb lead-II. Give normal value of P-R interval. 2x6 = 12

b. Give the normal value of coronary blood flow. Draw a diagram showing ECG changes following coronary thrombosis.

c. Explain the mechanism of flare in triple response in skin.

d. Give the effect of increased venous return on cardiac output.

e. Explain why myocardium cannot be tetanised.

f. Describe the mechanism by which catecholamines improve myocardial performance.

SECTION - II

3a. Enumerate 4 causes of hypovolumnic shock. Explain in brief how Explain in brief how body reacts to hypotension in shock. 4x5 = 20

b. Draw oxygen dissociation curve. How does severe exercise alter it?

c. Define vital capacity. What is the effect of section of spinal cord at C6 on it?

d. If surfactant production in lungs is decreased, how does it influence respiration?

e. What are mechanisms of respiratory changes in asphyxia?

SECTION - III

4. Draw a schematic diagram illustrating pathway for temperature sensation. Describe the sensory disturbances following hemisection of spinal cord below the level of lesion. 4+4 = 8

5a. List any four differences between upper and lower motor neuron lesions, in a tabular form. 2x6 = 12

b. Explain the physiological basis of decerebrate rigidity in a cat after midcollicular section.

c. Write in brief the mechanism of production of physiological nystagmus.

d. Describe any four clinical features of unilateral cerebellar disease.

e. Name any superficial reflex. Describe its clinical significance.

f. Mention any two sensations that should be tested in lesion of parietal lobe giving reasons.

SECTION - IV

6a. Describe the role of hypothalamus in food intake and feeding behaviour. 4x5 = 20

b. Describe the composition and functions of cerebrospinal fluid.

c. Define accommodation in eye. Explain how is it altered in old age.

d. What is the role of basilar membrane in discrimination of sound frequencies?

e. Explain the physiological basis of changes in visual acuity and pupil during adaptation to darkness.

BIOCHEMISTRY

BIOCHEMISTRY

EXAMINATION SCHEME

The evaluation of students in Biochemistry will be based on (i) Internal Assessment and (ii) University Examination.

University examination will consist of Part-I examination at the end of first academic year and Part-II examination at the end of second semester.

Allotment of marks for each part (Part I & II) examination in Biochemistry will be as follows:

A. INTERNAL ASSESSMENT:

a.	Periodic assessment	...	30 marks.
b.	Practical record marks	...	10 marks.

B. UNIVERSITY EXAMINATION:

a.	Theory examination	...	80 marks.
b.	Practical examination	...	40 marks.
c.	Viva voce	...	40 marks.
	TOTAL MARKS (A+B)	...	200 marks.

INTERNAL ASSESSMENT

Internal assessment shall be computed on the basis of notified theory, practical, viva voce tests conducted by the department.

A minimum number of five notified tests including terminal and send-up examination will be held in Biochemistry for each part (Part I & II). Average marks secured by the candidate in the best out of three tests will be converted to the denominator of 30.

In case the student is absent at a test for any genuine reason, he will be given due consideration while computing the marks. Marks for all tests and the internal assessment shall be notified.

Students who fail at the University examination can submit the application for improvement of the internal assessment to the controller of examination. For this purpose, they will be required to appear in at least three more tests including send up examination. Average of these tests will be taken into account for computing internal assessment for 30 marks.

Practical record marks will be added to the internal assessment calculated as given above.

UNIVERSITY EXAMINATION

There will be total of two examiners in Biochemistry: one internal and one external from other Universities.

The University examination will consist of following components for each part (Part I and Part II).

a) **THEORY:**

Each paper of 80 marks will comprise of four sections (Section I, II, III & IV) of 20 marks each. Break up details for theory paper and model question paper is enclosed separately. Each examiner will evaluate two sections.

PAPER SETTING: Paper setting shall be entrusted to the external examiner according to the guidelines laid down. Preferably the paper setter should also be examiner for practical and viva voce examination.

MODERATION: To avoid discrepancies in question setting as per laid down instructions, one internal examiner should be appointed as moderator.

b) **PRACTICAL AND ORAL EXAMINATION:** 40 + 40 marks.

Details of practical examination are enclosed. All the two examiners will conduct practical in two batches.

Maximum time - 3 hours for practical.
Maximum of 25 students will be evaluated per day.

Practical examination will be conducted in the morning and viva voce in the afternoon.

c) PASS MARKS:

A candidate shall be declared to have passed if he secures:

- 50% in university examination.

- 50% in theory, practical, viva voce and internal assessment taken together.

For awarding distinction, a candidate should have passed each part of the examination at the first attempt and secured a total of 75% or above marks in Part I and Part II combined together.

When a candidate has failed in any part of University examination, he will be required to subject himself to the entire examination again in the subject of Biochemistry.

No student shall be permitted to join paraclinical/clinical group of subjects until he has passed in all the pre-clinical subjects for which he will be permitted not more than four chances (actual examination) provided four chances are completed in 3 years.

WRITTEN EXAMINATION:

The written examination shall be of 3 hours duration and carry 80 marks:

The question paper shall conform to the following pattern:

Recall type of questions	...	40 marks
Understanding type (Interpretation)	...	20 marks
Application type (Problem solving)	...	20 marks

The question paper shall carry 80 marks and have four sections I, II, III & IV, each section carrying 20 marks.

Each section shall have questions and marks distribution as below:

Section I	Long answer question of 10 marksx1	=	10 marks
	Very short answer question of 3 marks & 2 marks	=	10 marks
Section II	Short answer question of 5 marks x 2	=	10 marks
	Very short answer question of 3 marks & 2 marks	=	10 marks
Section III	Long answer question of 10 marks x 1	=	10 marks
	Very short answer question of 3 marks & 2 marks	=	10 marks
Section IV	Short answer question of 5 marks x 2	=	10 marks
	Very short answer question of 3 marks & 2 marks	=	10 marks

Each section of the question paper shall be answered in separate answer book.

Each examiner shall evaluate two sections.

The distribution of topics to each section shall be as follows:

SECTION I:
Energy metabolism, nutrition, vitamins and chemistry (function and properties) Detoxication.

SECTION II:
Biological oxidation, bioenergetics, enzymes, digestion and absorption, genetics and methodology or techniques, molecular biology.

SECTION III:
Intermediary metabolism and immunology.

SECTIONIV:
Acid base, fluid and electrolyte balance, hormones, minerals, special products and tissues, function tests.

PRACTICAL EXAMINATION:

The practical examination shall be 3 hour duration carrying 50 marks (25 students per batch).

The practical examination shall have the following exercises to test the abilities of the students:

Qualitative exercise	..	15 marks
Quantitative exercise	..	12 marks
Spotters	..	5 marks
Urinalysis	..	5 marks
Problems	..	3 marks

All the two examiners shall assess the performance of the candidates in the practical examination.

ORAL EXAMINATION:

The oral examination shall carry 40 marks and all the examiners will conduct the oral examination for the candidates.

PASSING AND GRADING:

A candidate who scores 50% minimum in written, oral and practical examination and 40% in internal assessment shall be declared to have passed the examination.

A candidate who scores 75% or more in first attempt in written, oral, practical put together and internal assessment shall be awarded distinction.

A candidate who passes in the written examination but fails in practical examination or vice versa shall appear for the whole examination in the next sitting provided he also improves his internal assessment marks by attending classes regularly.

GUIDELINES FOR THE QUESTION SETTER IN BIOCHEMISTRY

Time: 3 hours. Max. marks: 80

(a) Types of questions and marks for each:

		Recall * type (R)	Understanding* type (V)	Application* type (A)
Long answer (10 marks)	x	2 Nos. = 20	..	..
Short answer (3 marks)	x	2 Nos. = 6	x 4 Nos. = 12	x 4 Nos. = 12
Very short answer(2marks)	x	7 Nos. = 14	x 4 Nos. = 8	x 4 Nos. = 8
Total marks		40	20	20

*The marks allocation to various types are only guidelines, but minimal deviations from the suggested level are permissible, like 30, 23, 18 or 42, 20, 18, etc.

(b) The question paper should have 4 sections called Section I, II, III and IV and each section shall be answered in separate answer books. Each section shall be evaluated by one examiner (Total 2 examiners - two sections for each).

(c) Allocation of subjects in various sections may be as follows:

SECTION I:

Energy metabolism, nutrition, vitamins and chemistry (structure, properties and function).

SECTION II:

Biological oxidation, enzymes, digestion and absorption, genetics and methodology or techniques.

SECTION III:

Intermediary metabolism, function tests.

SECTION IV:

Acid, Base and Fluid and electrolyte balance, hormones, minerals, special products and tissues.

MODEL QUESTION PAPER IN BIOCHEMISTRY

FIRST MBBS

Time: 3 hours. Max.marks: 80

Each section to be answered in separate answer books.
All sections carry equal marks.

SECTION-I

Marks

1a) When an Indian doctor participates in the Antarctic Expedition, what would happen to his BMR? What is its relevance? 2x2 = 4

b) Why do certain fats become rancid?

2a) Calculate the daily calorie requirements for an Indian medical student aged 22 years, height 162 cms and weight 55 Kg, the surface area 1.55 sq metres. His BMR is 41 cal/sq.m/hr. 3x2 = 6

b) Dextran infusion substitutes plasma infusion. What properties of dextrans are made use of in this.

3. What are the dietary sources of Vitamin A? How is it involved in vision? What structural changes does it undergo in the visual cycle? 10

SECTION-II

4a) Give one example each for endorganic and exorganic reactions. 2x7 = 14

b) Why do some patients of jaundice develop intolerance to dietary fat?

c) Malonate inhibits succinate dehydrogenease. How will you increase the enzyme activity without removing malonate?

d) Write down the different types of electrophoresis you know of.

e) What is the role of messenger RNA in protein biosynthesis?

f) Write down the sites of ATP production in the electron transport chain?

g) What is the difference between DNA polymerase and RNA polymerase?

5a) Milk consumption leads to abdominal pain, cramps and diarrhoea in some oriental adults. What substance in milk is responsible for this? How is it caused? 3x2 = 6

b) Carboxypeptidase is more efficient in the protein hydrolysis in the later stages of digestion than the initial stages. Explain.

SECTION-III

6a) Why does the administration of aminopterin inhibit the biogenesis of purine nucleotides? 2x2 = 4

b) A person suffers from polyuria with the specific gravity of urine as 1.00017. What is the biochemical disorder?

7a) The gastric analysis of a person revealed a large volume of resting juice having altered blood and a combined acidity of 30 clinical units. Explain the probable cause of this. 3x2 = 6

b) When an athlete runs, which metabolic process supplies energy? Why is only that process supplying energy at that time? What happens to the end product of that process, when he rests later?

8. Why is tricarboxylic acid cycle known as common metabolic pathway? Illustrate diagrammatically. 10

SECTION-IV

9a) A person has serum albumin level of 1.5 g/dl and suffers from edema. Correlate the findings. 2x7 = 14

b) On fasting the pancreas elaborates more glucagon. How does glucagon immediately restore blood glucose level?

c) Why does renal ammoniagenesis go up during prolonged starvation?

d) A person having albumin is vulnerable to sun-burns. Why?

e) Enumerate four important factors that influence the absorption of iron in the G.I. tract.

f) What are the factors regulating the level of serum calcium in our system?

g) List the four special products formed from tyrosine.

10a) Which tissue produces GABA? How? Why? 3x2 = 6

b) Why are people with deficiency of glucocorticoids unable to excrete water normally?