

M.Sc. (Med.) Entrance Exam
GROUP- A (MBBS/BDS)
ANATOMY

34 questions

1. Gross Anatomy

Introduction to Anatomy, nomenclature, anatomical position, planes, tissues and movements.

I. Osteology

(a) Names of the bones of the body and their position; classification of the bones with examples; general features of the bone and normal development; microscopic anatomy of bone; general pattern of blood supply; ossification of the bones of the limbs for age determination. X-rays of bones.

(b) Process of repair of bone.

2. Muscular System

(a) Classification and identification of the muscles of the body: main attachments, nerve supply and action(s), microscopic anatomy of muscles and the nerve terminations.

(b) Details of attachments of the muscles; ultrastructural features of muscle; mechanism of the movement

caused by the muscle/muscles and various forces exerted by them and their detailed action(s).

3. Arthrology

(a) Definition and classification of joints, general features of different types of joints; detailed study of major joints of the limbs and movements performed at various joints in the body.

(b) Microscopic anatomy of articular cartilage; maintenance of articular cartilages; blood supply and nerve supply of the joints.

4. Cardio Vascular System

(a) Normal position, external features and parts of the heart; internal features of the chambers of heart, names of the blood vessels and venous drainage of the organs, structures and body as a whole, conducting system of heart, fibroskeleton of heart.

(b) Variation(s), developmental anomalies of heart and blood vessels, valvular defects and their effects in pathogenesis of the anomalies.

5. Respiratory System

(a) Position, parts, relations, blood supply of upper and lower respiratory tract. Pleura, its reflection, nerve supply, pleural recesses and their significance, bronchopulmonary segments, their importance.

(b) Mechanism of respiration

6. Digestive System

(a) Position, extent, parts, relations, blood supply, nerve supply, lymphatic drainage and sphincters of the gastrointestinal system.

(b) Sphincteric action including functional implications.

7. Genito-Urinary System

(a) Parts, position, relations, blood supply, nerve supply and lymphatic drainage of uterus, cervix, vagina, ovary, ovarian duct, testes, epididymis, seminal vesicle, ductus deferens, prostate, kidney, ureter, urinary bladder and urethra

(b) Innervation of urinary bladder in detail

8. Endocrine System and Individual Endocrine Glands

(a) Various endocrine glands, their location, relations, blood supply, nerve supply and lymphatic drainage.

(b) Clinical manifestations of common endocrine disorders.

9. Nervous System and its components

(a) Parts of nervous system, neuron meninges, nerve terminals, neuroglia, myelination, degeneration and regeneration, ventricles, CSF, spinal cord and its blood supply. Motor and sensory pathways, cranial nerves, thalamus, cerebellum, limbic and autonomic pathways. Functional cortical areas, motor and sensory cortex and their blood supply.

10. Special Sensory Organs

(a) Gross Anatomy of :

- (i) eye ball, extra ocular muscles their nerve supply and actions (s)
- (ii) ear
- (iii) nose
- (iv) tongue, its musculature blood supply and lymphatic drainage.

11. Lymphatic System

(a) Location of the major groups of the lymphnodes of the body and their drainage areas. Gross anatomy of the major lymphatics specially thoracic duct and its tributaries.

12. Surface Anatomy

(a) Surface features of the body and projection of the outline of heart, its borders, surfaces and valves, lungs, their borders, fissures and hila, pleura, liver, kidneys and various abdominal and pelvic organs and important vessels and nerves

13. Cross Sectional Anatomy

Cross sections of thorax, abdomen and pelvis to understand the interrelationship of organs and structures.

II. Microanatomy

Microscope and basic principles of microscopy, commonly used stains, basophilic and acidophilic staining reactions and their significance. Commonly encountered artifacts. Brief principle of electron microscopy and interpretation of ultrastructural features.

GENERAL HISTOLOGY

Cell : detailed structure of cell and its components and their functional mechanisms.

Four primary tissues

Epithelium : Microscopic characteristics, types, functions, distribution, basal lamina, cell junctions, specialization of the cell surface and their structural details and functions; metaplasia.

Connective tissue : Cells, fibers and their structural features and functions. Intercellular substances, amorphous ground substance, types of connective tissue (loose areolar tissue, dense connective tissue) and their distribution. *Specialized connective tissue* : different types of cartilages and their functions and distribution. **Bone** : Cells, bone matrix, structural features of compact and cancellous bone, their distribution and functions, ossification, blood supply of a long bone.

Muscle : General features, detailed structure of : skeletal muscle, and molecular mechanisms of contraction, innervation of skeletal muscle, neuromuscular junction, morphological and histochemical basis of classification into type I and type II muscle fibers and their significance, structural and functional characteristics of cardiac and smooth muscle; innervation of cardiac and smooth muscle.

Nervous tissue : Structural characteristics of a neuron, axon and dendrites. Different types of neurons and their specific structural and functional features and distribution. Axonal transport, synapse, morphological and functional characteristics of different types of synapses. Neuroglia : types, structure and functions, blood brain barrier. Brief cytoarchitecture of the central nervous system, regeneration in CNS with particular emphasis on stem cells. Sensory and autonomic ganglia, peripheral nerves, myelin and myelination, degeneration and regeneration in peripheral nerves.

Histology of various organs/organ systems

Exocrine glands : Characteristics, simple and compound glands; types of secretions, modes of secretion, detailed structural features of a serous secreting cell and mucous secreting cell, serous and mucous acini, duct system, features of salivary glands, exocrine pancreas, sweat and sebaceous glands, mammary gland, bulbourethral gland etc.

Circulatory system : Structural features of heart; conducting and distributing arteries and arterioles; types of capillaries, their structural features and distribution and microcirculation, detailed structure of

endothelium; structural characteristics of large and small veins and venules arterio-venous shunts, lymphatics.

Respiratory system : Structural features of nose, nasopharynx, larynx, trachea, principal bronchi, lung including intrapulmonary bronchi, bronchioles, alveolar ducts, atria, alveoli, blood-air-barrier. Functions of different parts of respiratory system.

Skin and nerve-end-organs : Thick, thin and hairy skin, cell renewal and pigmentation of skin, skin appendages, healing of skin wounds, sensory receptors of skin. Functions of skin.

Immune system and lymphoid organs : Lymphocytes, their subtypes and functions. Humoral and cell mediated immunity. Thymus, lymph nodes, spleen, tonsils and other mucous associated lymphoid follicles.

Digestive system (GIT) : General organization, oral cavity, lip, cheek, tongue, taste buds, associated salivary glands. Layers of tubular digestive tract, esophagus, stomach, small intestine, gastroesophageal junction, gastroduodenal junction, large intestine, anal canal and rectoanal junction. Liver, internal organization of liver, liver lobule, liver acinus, significance of zonation in liver acinus, liver sinusoids, detailed structure of hepatocyte, bile canaliculi, bile ducts, gall bladder, bile duct and pancreas.

Endocrine glands : Thyroid, parathyroid, Islets of Langerhan's gland, adrenal cortex and medulla, their structural details, functional mechanisms, hypophysis cerebri, cell types secretion and their functions, hypophyseal portal circulation, common endocrine disorders

Urinary system : Detailed microscopic structure of kidney, cortex, medulla, pyramids, medullary rays, cortical columns, glomerulus, nephron, glomerular filtration juxtaglomerular apparatus, its structural features and functions, renal interstitium, collecting ducts, renal sinus, minor and major calyces, microcirculation of kidney, histophysiology of the kidney, renal pelvis and ureters, urinary bladder and urethra.

Female reproductive system : Ovary, ovarian stroma, primary and secondary graafian follicles, functions of various constituents and structural details of graafian follicles, atretic follicles, corpus luteum and its functions, corpus albicans. Oviducts, uterus, arterial supply of uterus, cyclic changes in uterine endometrium, fertilization, vagina, female external genitalia and mammary glands.

Male reproductive system : Testes, spermatogenesis, spermatozoon, cycle of seminiferous epithelium, sertoli cells, interstitial tissue Leydig cells, histophysiology of testes, epididymus, vas deferens, prostate, seminal vesicles, penis.

Human Genetics

(a) Cell, cell division, mitosis and meiosis, nucleus, DNA, chromosomes, classification, karyotype, chromosomal aberrations (Klinefelter, Turner and Down's Syndrome) Prenatal diagnosis for congenital abnormalities, sex determination.

(b) Pedigree chart, pathogenesis of chromosomal aberrations and their effects, recombinant DNA, genetic inheritance, genetic counselling, inborn errors of metabolism.

BIOCHEMISTRY

33 Questions

Biological cell

- (a) Architecture, compartmentation, cell membrane structure and functions; structure- function relationships.
- (b) Membrane transport.

Biomolecules

- (a) Function and classification of carbohydrates, lipids, protein and amino acids.
- (b) Stereoisomerism and chemistry of monosaccharides, amino acids, and fatty acids.
- (c) Structural organization and structure-function relationships of proteins. Hemoglobin and myoglobin, molecular mechanism of O₂ transport and storage. Molecular basis of sickle cell anaemia and thallemias.
- (d) Molecular mechanism of muscle contraction.
- (e) Plasma proteins, their functions and clinical significance.

Enzymes

- (a) Nomenclature, classification,
- (b) Kinetics, mechanism of enzymatic catalysis.
- (c) Factors influencing enzymatic catalyses, enzyme activators and inhibitors.
- (d) Regulation of enzyme activity,
- (e) Clinical enzymology, isoenzymes.

Metabolic pathways, their regulation and metabolic interrelationships

Metabolism: general concepts and characteristics of metabolic pathways.

Carbohydrate metabolism

- (a) Pathways of glucose metabolism: glycolysis
- (b) HMP shunt
- (c) Gluconeogenesis
- (d) Glycogenolysis, glycogenesis
- (e) Galactose and fructose metabolism
- (f) Glycogen storage disease
- (g) Inborn errors of glucose metabolism
- (h) Regulation of glucose metabolism.

Amino acid metabolism

- (a) General reactions, transamination, its metabolic and diagnostic significance
- (b) Disposal of amino acid nitrogen and detoxication of urea
- (c) Metabolic fate of amino acid carbon skeleton
- (d) Sulphur containing amino acids
- (e) In born errors of branched chain and aromatic amino acids
- (f) Important amino acid derivatives.

Lipid metabolism

- (a) Biosynthesis and degradation of fatty acids, phospholipids and triacylglycerols
- (b) Biosynthesis of cholesterol, chemistry and metabolism of lipoproteins.
- (c) Hyperlipoproteinemias
- (d) Lipid storage disease.
- (e) Ketone bodies: their synthesis, utilization and conditions leading to ketoacidosis, prostaglandin.

TCA cycle and biological oxidation, prostanoids.

Regulation of the metabolic pathways

- (a) Carbohydrate, lipid and amino acid metabolism
- (b) Interlinks between these pathways.
- (c) Organ interrelationships in metabolism,

- (d) Blood glucose regulation, and its impairment in diabetes mellitus.
- (e) Metabolic adaptation in the fed state, fasting and prolonged starvation.
- (f) Metabolic derangements and adaptations in diabetes mellitus.

Food assimilation and nutrition

- (a) Digestive enzymes, their action on dietary carbohydrates, fats and proteins.
- (b) Absorption of glucose, amino acids and lipids.
- (c) Gastric, pancreatic and intestinal function tests, liver function tests.
- (d) Functions of dietary ingredients, the macro and micronutrients.
- (e) Fat soluble and water soluble vitamins
- (f) Malnutrition
- (g) Iron metabolism and heme synthesis.

Hormones

- (a) Molecular basis of hormonal action, signal transduction mechanisms.
- (b) Chemistry, functions and mechanism of action of hormones of the pituitary, thyroid, parathyroid, adrenals, pancreas, and gonads.
- (c) Biosynthesis of steroid hormones their functions and mechanism of action.
- (d) Pineal body
- (e) Endorphins and enkephalins,
- (f) Calcium homeostasis.
- (g) Hormonal interplay in the regulation of metabolism.

Molecular Biology

- (a) Nucleic acids: DNA and RNA structure
- (b) DNA Replication,
- (c) DNA Transcription
- (d) Post-transcriptional processing.
- (e) Translation of genetic code
- (f) Regulation of gene expression and protein synthesis inhibitors of protein synthesis.
- (g) DNA repair mechanisms,
- (h) Applied aspects of purine and pyrimidine metabolism
- (i) Genetic Engineering: Recombinant DNA technology
- (j) DNA and diagnostics
- (k) DNA repair mechanisms and related disorders
- (l) Telomeres, telomerases
- (m) Inhibitors of DNA replication, apoptosis

pH, Buffer, physiological buffer systems

- (a) Regulation of blood pH, acidosis, alkalosis,
- (b) Renal functions tests.

Immunology

- (a) Reticuloendothelial system, components and functions of the innate and adaptive immunity.
- (b) Role of T and B lymphocytes, antigen presentation
- (c) Induction of immune response
- (d) Cell mediated immune response
- (e) Immunoglobulin structure and functions
- (f) Humoral immune response
- (g) Fate of antigen antibody complex,
- (h) Complement system
- (i) Generation of antibody diversity,
- (j) Hypersensitivities
- (k) Immunoregulation, autoimmunity, tolerance
- (l) HLA, disease association & transplantation
- (m) Immunological techniques, application in medicine (vaccines, immunotherapy, immunoassays and immunodiagnosics).

PHYSIOLOGY

33 Questions

General Physiology

1. Mutual introduction of dramatis personae in the teaching learning process
2. Know thy institute
3. Physiology: what and why? Homeostasis: an evolutionary point of view
4. Characteristics of control systems
5. Looking back & forth
6. Reading efficiently

Nerve–Muscle

1. Physicochemical properties of cell membrane
2. Cell membrane: permeability & transport
3. Principles of bioelectricity
4. Genesis of resting membrane potential
5. Action potential
6. Properties of nerve-fibres
7. Functional anatomy of neuromuscular junction
8. Neuromuscular transmission
9. Muscle proteins – (Biochemistry)
10. Excitation – contraction coupling
11. Contraction kinetics of skeletal muscles
12. Smooth muscle
13. Injury & repair of nerves and muscles
14. Energetics of nerve & muscle
15. Work Physiology

Blood

1. Functions of plasma proteins
2. Principles of hemopoiesis
3. Regulation of erythropoiesis
4. Destruction of red cells: Jaundice
1. Anemia
5. Regulation of WBC production
6. Functions of WBC
7. Functions of platelets
8. Hemostasis
9. Blood groups
10. Physiological basis of transfusion medicine

Respiratory System

1. Introduction to respiratory system
2. Lung volumes and capacities
3. Mechanics of respiration – I
4. Mechanics of respiration – II
5. Composition of respired air: pulmonary ventilation
6. Exchange of gases in the lungs
7. Ventilation – perfusion ratio
8. O₂ carriage, O₂–dissociation curve
9. CO₂ carriage, CO₂–dissociation curve
10. Neural regulation of respiration
11. Chemical regulation of respiration
12. Hypoxia, cyanosis and dyspnoea
13. Special features of pulmonary circulation
14. Artificial respiration Artificial respiration

15. Therapeutic use of oxygen .

Cardiovascular System

1. Introduction to CVS
2. Properties of cardiac muscle
3. Action potential and spread of impulse in the heart
4. E-C coupling in the myocardium
5. ECG
6. Pressure changes in the heart. Cardiac cycle
7. Functional basis of heart sounds and murmurs
8. Neural regulation of cardiac activity
9. Regulation of heart rate
10. Intrinsic regulation of heart's action. Cardiac output
11. Cardiac output: measurement and regulation
12. Nutrition and metabolism of heart
13. Exercise physiology
14. General principles of hemodynamics
15. Cardiovascular reflexes
16. Neural control of circulation
17. Special features of cerebral circulation
18. Special features of circulation in skeletal muscles and skin

Gastrointestinal System

1. Introduction to G.I. Physiology: general organization of G.I. tract
2. Mastication and deglutition
3. Gastric secretion
4. Regulation of gastric secretion
5. Pathophysiology of peptic ulcer
6. Biliary and pancreatic secretions
7. Physiology of colon
8. Pathophysiology of diarrheal disease

Nutrition

1. Introduction to nutrition. RMR
2. Carbohydrates and dietary fiber
3. Proteins
4. Fats
5. Recommended dietary allowances
6. Diet during pregnancy and lactation
7. Diet during infancy and childhood

Environmental Physiology

1. Introduction to environmental physiology
2. Body temperature regulation
3. Man in cold environment
4. Man in hot environment
5. Hypothermia and its clinical applications
6. Physiological responses to high altitude
7. Physiological responses to high atmospheric pressure

Reproduction

1. Introduction to reproductive system
2. Male reproductive physiology
3. Female reproductive physiology
4. Hypothalamic – pituitary – gonadal axis
5. Puberty
6. Pregnancy
7. Parturition and lactation
8. Reproductive ageing

Kidney

1. Renal hemodynamics and glomerular filtration
2. Renal tubular function – I
3. Renal tubular function – II
4. Regulation of renal function
5. Physiological basis of renal function tests
6. Micturition

Neurophysiology

General

1. Introduction to neurophysiology I
2. Introduction to neurophysiology II
3. CSF
4. Neuroglial cells
5. Synaptic transmission
6. Properties of synaptic transmission
7. Neurotransmitters

Sensory system

1. Coding of sensory information
2. Functional organization of ascending sensory pathways
3. Thalamus
4. Sensory cortex
5. Perception of sensory stimuli
6. Physiology of pain

Motor system

1. Characteristics and properties of reflexes
2. Functional organization of motor system – I
3. Functional organization of motor system – II
4. Brain stem reflexes, stretch reflexes and tendon reflexes
5. Basal ganglia
6. Cerebellum
7. Vestibular neck reflexes: maintenance of equilibrium
8. Localizing the level of lesion in neurological disease

Visceral and motivational system

1. Autonomic nervous system
2. Hypothalamus
3. Limbic system and emotions

EEG, sleep and higher nervous functions

1. Electroencephalography
2. Sleep and wakefulness
3. Learning and memory – I
4. Learning and memory – II
5. Speech