PHYSIOLOGY ENDOCRINOLOGY

S. NO.	TOPIC	DETAILS
1.	Introduction to endocrinology	***At the end of lecture students should be able to:***
		• Describe the chemical structure and synthesis of hormones. • Explain hormone secretion, transport and clearance from the blood. • Describe generally the mechanism of action of different hormones. • Describe the method of measurement of hormone concentration in the blood.
2.	Pituitary hormones and their control by the hypothalamus	***At the end of lecture students should be able to:***
		• Describe the physiologic anatomy of pituitary gland. • Describe the control of pituitary gland by hypiothalamus. • Enumerate hormones secreted from anterior and posterior pituitary glands.
	Growth hormone	***At the end of lecture students should be able to:***
		• Growth hormone, antidiuretic hormone and oxytocin. • Explain their physiologic effects in detail. • Enumerate the disorders due to their deficiency or over secretion. • Give pathophysiology and sign and symptoms of each disorder.
3.	Thyroid metabolic hormones	***At the end of lecture students should be able to:***
		• Describe the synthesis and secretion of thyroid hormones. • Describe the physiologic functions of thyroid hormones. • Describe the regulation of thyroid hormone secretion. • Describe the diseases of thyroid gland.
4.	Adreocortical hormones 1. Mmineralocorticoids 2. Glucocorticoids 3. Adrenal androgens	***At the end of lecture students should be able to:***
		• Describe the synthesis, secretion and names of adrenocortical hormones. • Describe the physiological roles of mineralocorticoids, glucocorticoids and adrenal androgens. • Describe abnormalities of adrenocortical secretion.
5.	**INSULIN, GLUCAGON, AND DIABETES MELLITUS**	
	Insulin	***At the end of lecture students should be able to:***
		• Describe the synthesis, secretion and mechanism of action of insulin. • Describe the metabolic effects of insulin. • Describe the physiologic roles of glucagon. • Describe the regulation of blood glucose.
6.	Parathyroid hormone, calcitonin,	***At the end of lecture students should be able to:***

	calcium and phosphate metabolism, vitamin D, bone, and teeth	• Describe briefly the regulation of calcium and phosphate in extra cellular fluid and plasma. • Enumerate non-bone physiologic effects of altered calcium and phosphate concentrations in the body fluids. • Describe bone and its relation to extracellular calcium and
	Vitamin D PTH Calcitonin	***At the end of lecture students should be able to:*** • Describe the physiologic roles of vitamin D, parathyroid hormone and calcitonin. • Describe the summary of control of calcium ion concentration. • Describe the pathophysiology of parathyroid hormone, vitamin D and bone disease.

PHYSIOLOGY OF REPRODUCTION

S. NO.	TOPIC	DETAILS
1.	**REPRODUCTIVE AND HORMONAL FUNCTIONS OF THE MALE**	
	Male Reproductive system	***At the end of lecture students should be able to:*** • Define Reproduction. • Describe Importance of Reproduction. • Give brief description of physiological anatomy of male
	Spermatogenesis	***At the end of lecture students should be able to:*** • Define spermatogenesis. • Explain the process of spermatogenesis. ➢ Sex determination. ➢ Structure of sperm ➢ Process of maturation of sperms. ➢ Physiology of mature sperms.
	Semen	***At the end of lecture students should be able to:*** • Describe the term semen. Give the characteristics of semen.
	Capacitation And Acrosomal Reaction	***At the end of lecture students should be able to:*** • Describe capacitation and acrosomal reaction. • Describe the process of fertilization of ova. • Describe the effect of abnormal spermatogenesis on male fertility.
	Prostate gland and seminal	***At the end of lecture students should be able to:*** • Enlist the functions of prostate gland and seminal vesicle in reproduction.

	Androgens	***At the end of lecture students should be able to:***
		• Describe and explain the term androgens. • Enumerate different types of androgens produced in males.
	Testosterone	***At the end of lecture students should be able to:***
		• Describe the physiology of male sex hormone. • Enumerate and explain various physiologic effects of testosterone in males. • Explain the mechanism of action of testosterone.
	Regulation of testosterone	***At the end of lecture students should be able to:***
		• Describe the control of male sexual functions by hormones from hypothalamus and anterior pituitary.
	Abnormalities of male sexual function	***At the end of lecture students should be able to:***
		• Briefly describe the abnormalities of male sexual function.
	Climacteric	***At the end of lecture students should be able to:***
		• Define climacteric.
2.	**FEMALE PHYSIOLOGY BEFORE PREGNANCY AND THE FEMALE HORMONES.**	
	Female sex hormones	***At the end of lecture students should be able to:***
		• To explain the physiology of female sex hormones.
	Monthly ovarian cycle	***At the end of lecture students should be able to:***
		• Describe monthly ovarian cycle in females.
	Monthly endometrial cycle	***At the end of lecture students should be able to:***
		• Describe monthly endometrial cycle and process of menstruation in females.
		• Describe the regulation of female monthly rhythm.
	Important concept regarding	***At the end of lecture students should be able to:***

	reproduction	• Define and briefly explain
		  ○ Puberty
		  ○ Anovulatory cycles
		  ○ Menopause
		  ○ Menarche
		  ○ Hypogonadism
		  ○ Amenorrhoea
		  ○ Hypersecretion by ovaries
		  ○ Irregular menses
		  ○ Fertile period of sexual cycle
		  ○ Rhythm method of contraception
		  ○ Hormonal suppression of fertility
		• Describe abnormal conditions that cause female sterility.

3.	**PROCESS OF MATURATION AND FERTILIZATION OF OVUM**	
	Pregnancy and Lactation Fertilization	***At the end of lecture students should be able to:*** • Describe the process of maturation and fertilization of ovum. • Explain the transport of fertilized ovum. • Describe the process of implantation of fertilized ovum.

	Placenta	***At the end of lecture students should be able to:***
		• Explain in detail the
		  ○ Physiologic anatomy of placenta.
		  ○ Functions of placenta.

	Pregnancy	***At the end of lecture students should be able to:***
		• Enumerate hormones released during pregnancy.
		  ○ Give their duration of secretion
		  ○ Give their sites of secretion
		  ○ Give the physiologic effects of each of these hormones.
		• Describe the response of mothers body to pregnancy.

	Parturition and labor	***At the end of lecture students should be able to:*** • Define and explain the mechanism of parturition. • Define labor and explain its mechanism.
	Lactation	***At the end of lecture students should be able to:***

		• Define lactation and explain in detail the physiologic events resulting in lactation.explain o Development of female breast. o Initiation of lactation o Role of estrogen, progesterone, prolactin and o Oxytocin in lactation o Ejection or let down o Role of hypothalamus o Inhibition of milk ejection. o Composition of mothers milk o Compare and contrast mothers milk with cows milk
4.	Physiology of Fetal Fetal and Neonatal Physiology	***At the end of lecture students should be able to:*** • Describe the growth and functional development of fetus.
	Adjustment of infant to extrauterine life	***At the end of lecture students should be able to:*** • Describe the physiologic changes which are responsible for the adjustment of infant to extrauterine life.
	Special functional problems in neonates	***At the end of lecture students should be able to:*** • Enumerate andbriefly explain special functional problems in neonates and special problems of prematurity.
	Growth and development of child	***At the end of lecture students should be able to:*** • Briefly describe the o Growth and development of child. o Behavioral growth.

PHYSIOLOGY OF GIT

S. NO.	TOPIC	DETAILS
1.	**PHYSIOLOGY OF GIT GENERAL PRINCIPLES OF GASTROINTESTINAL FUNCTION, MOTILITY, NERVOUS CONTROL, AND BLOOD CIRCULATION**	
	Physiologic anatomy of GIT	***At the end of lecture students should be able to:*** • Explain the physiologic anatomy of GIT.
	Electrical activity of GIT	***At the end of lecture students should be able to:***

	smooth muscle	• Explain the electrical activity of GIT smooth muscle .Describe the concept of following o Slow waves o Spike potentials o Role of calcium ions in muscle contraction. o Tonic contraction.
	Enteric nervous system	***At the end of lecture students should be able to:*** • Describe enteric nervous system. o Compare and contrast myenteric and meissener plexus. o Enumerate neurotransmitters of enteric nervous system. o Describe the autonomic regulation of enteric nervous system. o Enumerate afferent sesory connections of enteric nervous system.
	GIT reflexes.	***At the end of lecture students should be able to:*** • Enumerate and explain GIT reflexes.
	GIT motility	***At the end of lecture students should be able to:*** • Describe the hormonal control of GIT motility.
	Splanchnic circulation	***At the end of lecture students should be able to:*** • Briefly explain o Splanchnic circulation. o Anatomy of GIT blood supply. o Counter current blood flow in villi. o Nervous control of GIT blood supply.
	Types of movements of GIT	***At the end of lecture students should be able to:*** • Enumerate different types of movements of GIT . • Define and explain propulsive movements. • Define and explain mixing movements. • What is peristaltic reflex? • Explain factors which increase and decrease motility.
2.	**PROPULSION AND MIXING OF FOOD IN THE ALIMENTARY TRACT**	
	Mastication and chewing reflex	***At the end of lecture students should be able to:*** • Describe mastication. • Describe chewing reflex. • Enumerate roles of mastication.
	Swallowing reflex	***At the end of lecture students should be able to:*** • Explain swallowing reflex. Describe the different stages of swallowing reflex, explain briefly each stage. Also give nervous control of each stage.

	Motor functions of stomach	***At the end of lecture students should be able to:***
		• Describe the motor functions of stomach in detail. o Storage. o Mixing and propulsion of food o Formation of chime. o Stomach emptying.
	Regulation of stomach emptying	***At the end of lecture students should be able to:***
		• Describe the regulation of stomach emptying.
	Types of movements of small intestine	***At the end of lecture students should be able to:***
		• Explain different types of movements of small intestine. o Define propulsive movements. o Describe segmental contractions. o Describe the control of peristalsis by nervousand hormonal mechanisms. o Describe peristaltic rush. o Explain the function of ileocaecal valve. o Briefly explain the feed back control of ileocaecal sphincter.
	Types of movements of large intestine	***At the end of lecture students should be able to:***
		• Describe various types of movements of large intestine. • Describe Haustrations and mass movements. • Explain the role of Gastrocolic and Duodenocolic reflex in large intestine motility.
	Defecation reflex	***At the end of lecture students should be able to:***
		• Explain defecation reflex, its importance and nervous control
3.	Secretory Functions of the Alimentary Tract	***At the end of lecture students should be able to:***
		• Explain the general principles of alimentary tract secretion.
	Saliva	***At the end of lecture students should be able to:***
		• Describe the secretion and composition of saliva and its physiologic roles. • Describe the nervous regulation of saliva
	secretion of gastric juice	***At the end of lecture students should be able to:***
		• Describe the secretion of gastric juice. o Describe the basic mechanism of HCl secretion. o Describe the secretion and activation of pepsinogen o Describe the secretion of intrinsic factor . o Describe the secretion of mucous and gastrin. • Describe the regulation of gastric secretions.
	Pancreatic secretions	***At the end of lecture students should be able to:***

		• Describe the characteristics of pancreatic secretions.
		  o Enumerate pancreatic digestive enzymes.
		  o Role of trypsin inhibitor.
		  o Secretion of bicarbonate ions.
		• Describe the regulation of pancreatic secretion.

	Secretion bile of	***At the end of lecture students should be able to:***
		• Explain the mechanism of secretion of bile. • Enlist and explain the functions of biliary tree. • Describe the composition of bile. • Explain the physiological role of bile in fat digestion. • Explain the formation of gall stones.
	Secretions of small and large intestine.	***At the end of lecture students should be able to:***
		• Briefly explain the secretions of small and large intestine.
4.	Digestion and Absorption in the Gastrointestinal Tract	***At the end of lecture students should be able to:***

		• Enumerate dietary sources of carbohydrates,fats and proteins.
		• Briefly describe the role of hydrolysis in digestion of food.
		• Explain in detail
		  o The digestion of carbohydrates,fats and proteins.state enzymes at relevant steps.
		  o Describe the sites of absoption.
		  o Also explain the action of enzymes in detail with the end products produced.

	Structure of villi and absorption in small intestine	***At the end of lecture students should be able to:***

		• Describe the structure of villi.
		• Enumerate the features of small intestine which increase its surface area.
		• Explain the mechanism of absorption of
		  o Fluids
		  o Ions
		  o carbohydrates,fats and proteins .

	Process of absorption in large intestine	***At the end of lecture students should be able to:***
		• Describe the process of absorption in large intestine.
5.	Physiology of Gastrointestinal Disorders	***At the end of lecture students should be able to:***

		• Enlist and briefly describe the disorders of
		  o Swallowing and oesophagus.
		  o Stomach.
		  o Small and large intestine.
		• Describe the pathophysiology of
		  o Vomiting.
		  o Flatus
		  o GI obstruction
		  o Nausea.

PHYSIOLOGY OF NERVOUS SYSTEM

S. NO.	TOPIC	DETAILS
1.	**ORGANIZATION OF THE NERVOUS SYSTEM**	
	Organization of the Nervous System	***At the end of lecture students should be able to:***
		• Describe the general organization of nervous system. • Describe major levels of central nervous system function.
	Synapse	***At the end of lecture students should be able to:***
		• Define synapse. • Enumerate its various types. • Describe the process of synaptic transmission.
	Electrical events during neuronal excitation and inhibition.	***At the end of lecture students should be able to:***
		• Describe the determinants of resting membrane potential of neuron. • Describe the electrical events during neuronal excitation and inhibition. • Enumerate special functions of denderities in the excitation process.
	Neurotransmitter	***At the end of lecture students should be able to:***
		• Enumerate the important neurotransmitters of nervous system. Explain their biochemistry and physiological roles.
	Characteristics of synaptic transmission.	***At the end of lecture students should be able to:***
		• Enlist and explain the characteristics of synaptic transmission.
2.	Sensory Receptors, Neuronal Circuits for Processing Information, types of sensory receptors	***At the end of lecture students should be able to:***
		• Enumerate and explain different types of sensory receptors. • Describe labeled line principle. • Describe the generation of receptor potential and adaptation of different types of receptors.
	Physiologic classification of nerve fibers	***At the end of lecture students should be able to:***
		• Describe the physiologic classification of nerve fibers. Also describe different types of signals they carry.
	Temporal and spatial summation	***At the end of lecture students should be able to:***
		• Explain temporal and spatial summation.
	Neuronal pools	***At the end of lecture students should be able to:***
		• Describe the transmission and processing of signals in neuronal pools. • Briefly explain stability and instability of neuronal pools.
3.	Somatic Sensations: I. General Organization,	***At the end of lecture students should be able to:***

	the Tactile and Position Senses	• Classify somatic senses. • Describe the detection and transmission of tactile sensations.
	Dorsal colomn and Antrolateral system	***At the end of lecture students should be able to:*** • Describe the two sensory pathways for transmission of somatic sensations into central nervous system. • Compare and contrast dorsal column medial lemniscal system and antrolateral system. • Describe the physiologic anatomy and characteristics of transmission in the dorsal column medial lemniscal system and antrolateral system. • Enumerate sensations carried by dorsal column system and antrolateral system.
	Somatosensory cortex and somatosensory association areas	***At the end of lecture students should be able to:*** • Describe somatosensory cortex and somatosensory association areas. • Describe the functions of thalamus in somatic sensations. • Describe corticofugal signals and dermatomes.
4.	Somatic Sensations: II. Pain, Headache, and Thermal Sensations	***At the end of lecture students should be able to:*** • Define pain. • Enumerate different types of pain and explain their characteristics. • Describe pain receptors and mechanism of stimulation of pain receptors. • Compare and contrast neospinothalamic and paleospinothalamic tract.
	Analgesia system in spinal cord	***At the end of lecture students should be able to:*** • Describe analgesia system in spinal cord and brain for pain suppression.
	o Reffered pain. o Visceral pain. o Hyperalgesia. o Shingles o Tic Douloureux o Brown-sequard syndrome. o Head aches of intracranial origin.	***At the end of lecture students should be able to:*** • Define • Give causes • Give mechanism • Discuss the management
	Thermal sensations	***At the end of lecture students should be able to:*** • Describe thermal sensations, thermal receptors and their excitation. • Describe transmission of thermal signals in the nervous system.
5.	**THE EYE: I. OPTICS OF VISION**	

	Basic concepts	***At the end of lecture students should be able to:***

		• Describe the physical principles of optics.
		• Compare optics of eye with a camera.
		• Define and describe
		  ○ Accommodation.
		  ○ Pupillary diameter.
		  ○ Errors of refraction.
		  ○ Visual acuity
		  ○ Depth perception

	Ophthalmoscope	***At the end of lecture students should be able to:***
		• Describe different parts • How it operate • Describe fluid system of the eye in detail.
6.	The Eye: II. Receptor and Neural Function of the Retina	***At the end of lecture students should be able to:***
		• Describe the anatomy and function of the structural elements of retina. • Describe in detail Rhodopsin-retinal visual cycle.
	Light and dark adaptation	***At the end of lecture students should be able to:***
		• Devine • Give mechanism • Describe in detail light and dark adaptation.
	Colour vision	***At the end of lecture students should be able to:***
		• Describe tricolor mechanism of colour vision. • Explain colour blindness, its genetic basis and effects on daily life of the patient.
	Neural functions of retina	***At the end of lecture students should be able to:***

		• Describe the neural functions of retina.Explain
		  ○ Neural circuitary of retina
		  ○ Role of ganglion cells and optic nerve fibers in the neural functions.
		  ○ Excitation of ganglion cells.

7.	The Eye: III. Central Neurophysiology of Vision	***At the end of lecture students should be able to:***
		• Describe the functions of dorsal lateral geniculate nucleus of thalamus in the visual pathway. • Describe the structure of primary visual cortex.Describe the effect of removing primary visual cortex. • Enumerate and explain the two major pathways for analysis of visual information. • Describe the mechanism of detection of color.
	Perimetery	***At the end of lecture students should be able to:***
		• Explain the method of perimetery.

	Eye movements	***At the end of lecture students should be able to:***
		• Explain different types of eye movements and their control. • Explain autonomic control of accommodation and papillary diameter.
8.	The Sense of Hearing	***At the end of lecture students should be able to:***
		• Describe the structure of tympanic membrane and ossicular system.
	Transmission of sound waves	***At the end of lecture students should be able to:***
		• Describe the conduction of sound from tympanic membrane to cochlea. • Describe the transmission of sound through bone.
	Organ of corti	***At the end of lecture students should be able to:***
		• Describe the functional anatomy of cochlea. • Describe the transmission of sound waves in cochlea. • Describe the functions of organ of corti. • Describe Place principle.
	Central auditory mechanisms of hearing	***At the end of lecture students should be able to:***
		• Describe the central auditory mechanisms of hearing. • Define deafness and its types.
9.	The Chemical Senses Taste and Smell Taste sensation	***At the end of lecture students should be able to:***
		• Describe o Primary sensations of taste. o Taste bud and its functions. o Transmission of taste signals into nervous system. o Taste preference and control of diet.
	Smell sensation	***At the end of lecture students should be able to:***
		• Describe o Structure of alfactory membrane. o Stimulation of alfactory cells. o Transmission of smell signals into central nervous system.
10.	Motor Functions of the Spinal	***At the end of lecture students should be able to:***

	Cord; the Cord Reflexes	• Compare and contrast Spinal Animal with the Decerebrate Animal. • Describe the organization of the spinal cord for motor functions.Give general characteristics of the following in detail o Anterior Motor Neurons. o Alpha Motor Neurons. o Gamma Motor Neurons. o Interneurons. o Renshaw Cell Inhibitory System. o Propriospinal Fibers
	Muscle spindle and muscle stretch reflex	***At the end of lecture students should be able to:***
		• Define Muscle Sensory Receptors. o Describe muscle spindles and golgi tendon organs in detail regarding their roles in muscle control. • Explain muscle spindle in detail keeping the following points in mind. • Structure , sensory and motor innervation of the muscle spindle. • Dynamic and Static responses of the muscle spindle. • Control of intensity of the Static and Dynamic responses by the Gamma Motor nerves. • Continuous discharge of the muscle spindles under normal conditions. • Muscle Stretch reflex • Role of the muscle spindle in voluntary motor activity • Brain areas for control of the gamma motor system • Stabilization of body position. • Describe the following points regarding muscle stretch reflex. o Neuronal Circuitry. o Dynamic and static components. o Damping function. o Damping Mechanism. o Clinical Applications. ▪ Knee jerk ▪ Other muscle jerks ▪ Clonus
	Role of golgi tendon organ	***At the end of lecture students should be able to:***
		• Describe the role of golgi tendon organ in o Controlling muscle tension. o Equalizing contractile force among muscle fibers. o Transmission of signals to CNS.

	Spinal cord Reflexes	***At the end of lecture students should be able to:***

		• Explain the neuronal mechanism and pattern of
		  ○ Flexor Reflex
		  ○ Withdrawal Reflexes
		  ○ Crossed Extensor Reflex
		  ○ Reciprocal inhibition and reciprocal innervations.
		• Enumerate and briefly describe the mechanism of the postural and locomotive reflexes of the cord.
		• Enumerate and briefly describe the mechanism of Spinal cord reflexes that cause muscle spasm.
		• Enumerate and briefly describe the mechanism of autonomic reflexes in the spinal cord
		• Describe the mechanism of Scratch reflex.
		• Describe the features of spinal shock after spinal cord

11.	Cortical and Brain Stem Control of Motor Function, Physiologic anatomy of motor cortex and corticospinal fibers	***At the end of lecture students should be able to:***
		• Describe the physiologic anatomy of motor cortex and corticospinal fibers. • Draw the motor and somatic association areas of motor cortex. • Enlist the specific functions of motor cortex, premotor cortex.and supplementary motor cortex. • Draw specialized areas of motor cortex and explain their function. • Enlist the effects of damage to the specialized areas of motor cortex. • Enumerate afferent and efferent connections of the motor cotex. • Explain transmission of signals from motor cortex to muscles. • Describe the excitation of spinal cord motor control areas.
	Location and functions of red nucleus	***At the end of lecture students should be able to:***
		• Describe the location and functions of red nucleus.
	roles of brain stem in controlling motor functions	***At the end of lecture students should be able to:***
		• Enumerate and explain the roles of brain stem in controlling motor functions.
	Vestibular apparatus	***At the end of lecture students should be able to:***

	Maintain of Equilibrium and balance	• Describe the physiologic anatomy of vestibular system in detail. • Describe how the equilibrium of body is maintained. Explain the roles of o Utricle o Saccule o Semicircular ducts. o Eyes o Brain stem nuclei o Neck proprioceptors o Central nervous system o Other body receptors.
12.	**CONTRIBUTIONS OF THE CEREBELLUM AND OVERALL MOTOR CONTROL**	
	Contributions of the Cerebellum Overall Motor Control	***At the end of lecture students should be able to:*** • Describe the physiologic anatomy of cerebellum. • Enlist and explain motor functions of cerebellum. • Draw anatomical functional areas of the cerebellum. • Describe neuronal circuit of cerebellum in detail. explain o Afferent and efferent connections. o Functional unit of cerebellar cortex o Neuronal circuit of functional unit o Deep cerebellar nuclei and their roles o Roles of purkinje cells, deep nuclear cells, inhibitory cells of cerebellum o Role of climbing fibers o Turn on ang turn off signals. • Describe the functions of cerebellum in overall motor control. • Enlist and explain the clinical abnormalities of cerebellum
	Basal Ganglia	***At the end of lecture students should be able to:*** • Describe the physiologic anatomy of basal ganglia. • Draw neuronal circuit of basal ganglia. • Enlist and explain the motor functions of basal ganglia. • Enlist and explain the physiological roles of neurotransmitters of basal ganglia system. • Enumerate and briefly explain the clinical abnormalities caused by damage to the basal ganglia system. • Describe the integration of the many parts of total motor control system.
13.	Higher mental functions of	***At the end of lecture students should be able to:***

	cerebral cortex specific cortical areas of the brain	• Enlist higher mental functions of cerebral cortex. • Enumerate specific cortical areas of the brain. • Draw specific cortical areas of the brain. • Describe specific cortical areas of the brain regarding their physiological roles and features if the area becomes damaged. • Enumerate the association areas of the brain. • Draw the association areas of the brain. • Describe association areas of the brain regarding their physiological roles and features if the area becomes damaged. • Describe wernickes area in detail. • Describe the concept of dominant hemisphere. • Enlist the roles of parieto-occipitotemporal cortex in non-dominant hemisphere. • Enumerate and explain the higher intellectual functions of prefrontal association areas.
	Sensory and motor aspects of communication	***At the end of lecture students should be able to:***
		• Describe the sensory and motor aspects of communication. Define o Wernickes aphasia o Motor aphasia o Global aphasia • Describe the functions of corpus callosum and anterior commissure in transferring information between the two cerebral hemisphere.
14.	Learning and memory	***At the end of lecture students should be able to:***
		• Define memory and classify it into its various types. • Describe the role of synaptic inhibition and synaptic facilitation in memory. • Describe the mechanism of short term, intermediate long term and long term memory. • Describe the mechanism of consolidation of memory. • Enumerate the specific parts of brain with their roles in memory,explain the role of each part.
	Activating driving system of the	***At the end of lecture students should be able to:***

	brain	• Define behavior. • Describe activating driving system of the brain. Explain the following o Reticular activating system. o Control of cerebral activity by signals from brain stem. ▪ Reticular excitatory area ▪ Reticular inhibitory area. ▪ Other afferent and efferent connections. o Neurohormonal system of brain. ▪ Norepinephrine system ▪ Dopamine system ▪ Serotonin system ▪ Acetyl choline system
	Limbic system	***At the end of lecture students should be able to:*** • Descibe the cocept of limbic system. • Describe the physiological anatomy of limbic system and hypothalamus. • Enlist and explain the roles of limbic system and hypothalamus. o Vegetative functions o Endocrine functions o Behavioural function o Reward and punishment function. • Enumerate and explain the roles of o Hippocampus o Amygdala o Limbic cortex
15.	States of Brain Activity—Sleep, Brain Waves, Epilepsy, Psychoses. Sleep	***At the end of lecture students should be able to:*** • Define sleep. • Enumerate the types of sleep. • Compare and contrast between two types of sleep. • Describe the basic theories of sleep in detail. • Describe the physiological effects of sleep. • Describe the sleep and wakefulness cycle.
	EEG	***At the end of lecture students should be able to:*** • Describe brain waves. Enumerate various types of brain waves. o Describe the origin of brain waves. o Describe the method to record them. o Describe EEG.
	Epilepsy and psychoses	***At the end of lecture students should be able to:***

		• Define Epilepsy. Enumerate and explain its various types.
		• Describe the psychotic behaviour and depression.
		  ○ Describe the roles of norepinephrine, serotonin and dopamine.
		  ○ Describe depression, mania, schizophrenia, Alzheimers disease.

16.	Autonomic Nervous System and the Adrenal Medulla	***At the end of lecture students should be able to:***

		• Describe the physiological anatomy of autonomic nervous system.
		• Describe the parasympathetic and sympathetic nervous system.
		  ○ Enumerate and explain their receptors, neurotransmitters and physiological effects.
		• Describe the physiological anatomy and physiological effects of adrenal medulla.
		• Draw a table showing the autonomic effects on various body organs.
		• Describe the following.
		  ○ Relation of stimulus rate to autonomic effect.
		  ○ Sympathetic and parasympathetic tone.
		  ○ Denervation hypersensitivity.
		  ○ Alarm and stress response
		  ○ Mass stimulation
		  ○ Autonomic reflexes
		  ○ Medullary, pontine and mesencephalic response of autonomic nervous system.
		• Briefly describe the pharmacology of autonomic nervous system.

17.	Cerebral Blood Flow,	***At the end of lecture students should be able to:***
		• Describe briefly the physiologic anatomy of the cerebral blood supply. • Give the normal rate of cerebral blood flow. • Describe the regulation of cerebral blood flow. • Describe the concept of cerebral blood flow and briefly describe stroke.
	Cerebrospinal Fluid, and Brain Metabolism	***At the end of lecture students should be able to:***

		• Describe the cerebrospinal fluid system.Explain
		  ○ Formation, flow and absorption of CSF.
		  ○ Functions of CSF.
		  ○ Method to record CSF pressure.
		  ○ Hydrocephalous
		  ○ Blood CSF barrier.

	Brain edema	***At the end of lecture students should be able to:***

		• Describe brain edema.
	Metabolism of brain	***At the end of lecture students should be able to:***
		• Describe the metabolism of brain.

PHYSIOLOGY OF RENAL AND KIDNEY

S. NO.	TOPIC	DETAILS
1.	The Body Fluid Compartments: Extracellular and Intracellular Fluids; Interstitial Fluid and Edema	***At the end of lecture students should be able to:***
		• Give the normal values of fluid intake and output of normal adult male. • Describe body fluid compartments. • Give the normal volumes of extracellular, intra cellular fluid volume, interstitial fluid and plasma. • Compare and contrast the composition of extra and intracellular fluids.
	Methods to measure fluid volumes in different body fluid compartments	***At the end of lecture students should be able to:***
		• Describe the indicator dilution principle. • Explain the methods to measure fluid volumes in different body fluid compartments. o Measurement of ▪ Total body water. ▪ Plasma volume. ▪ Blood volume. o Calculate volume of ▪ Intracellular volume. ▪ Interstitial fluid volume.
	Principles of osmosis and osmotic pressure	***At the end of lecture students should be able to:***
		• Describe the regulation of fluid exchange and osmotic equilibrium between extra and intracellular fluids. • Explain the principles of osmosis and osmotic pressure. • Define hypotonic, hypertonic and isotonic fluids. • Define isoosmotic,hypoosmotic and hyperosmotic fluids. • Describe the volumes and osmolality of extracellular and intracellular fluids in abnormal states. • Enumerate and explain hypo and hypernatremia.
	Edema	***At the end of lecture students should be able to:***

		• Edema
		  o Define edema, enumerate its various types.
		  o Explain the mechanism of production of edema.
		  o Enlist causes of edema.
		  o Describe the safety factor for preventing edema.
		• Enumerate the potential spaces in body.

2.	Urine Formation by the Kidneys: I. Glomerular Filtration, Renal Blood Flow, and Their Control	***At the end of lecture students should be able to:***
		• Enlist and explain various functions of kidney.
	Physiologic anatomy of kidneys	***At the end of lecture students should be able to:***
		Describe the physiologic anatomy of kidneys.
	Renal blood supply	***At the end of lecture students should be able to:***
		• Briefly explain renal blood supply.
	Cortical and juxtamedullary neurons	***At the end of lecture students should be able to:***
		• Compare and contrast cortical and juxtamedullary neurons. • Location • Structure • Function
	Micturition	***At the end of lecture students should be able to:***

		• Micturition
		  o Define and describe miturition and miturition reflex respectively.
		  o Describe the physiologic anatomy and nervous connections of bladder.
		  o Explain the pathway of urine from ureters to bladder.
		  o Draw and explain cystometrogram.
		  o Enumerate and describe the abnormalities of miturition.

	Urine formation by the kidneys	***At the end of lecture students should be able to:***

		• Describe the process of glomerular filteration, tubular reabsorption and tubular secretion.
		• Define glomerular filteration rate.
		  o Give its normal value.
		  o Describe the physiologic anatomy of glomerular membrane.
		  o Enumerate and explain the determinants of GRF.

	Renal blood flow and	***At the end of lecture students should be able to:***

	physiologic control of GFR	• Explain renal blood flow. ○ Enumerate and explain the determinants of RBF. • Explain in detail the physiologic control of GFR and RBF. • Describe the phenomena of autoregulation for GFR and RBF.
3.	Physiology of tubular reabsorption. Urine Formation by the Kidneys: II. Tubular Processing of the Glomerular Filtrate	***At the end of lecture students should be able to:***
		• Describe the salient features of tubular reabsorption. • Enumerate and explain active and passive mechanisms involved in tubular reabsorption. • Describe reabsorption and secretion of substances along different parts of the nephron. • Explain in detail the regulation of tubular reabsorption.
	Clearance	***At the end of lecture students should be able to:***
		• Explain clearance method to quantify renal function.
4.	Regulation of Extracellular Fluid Osmolarity and Sodium Concentration	***At the end of lecture students should be able to:***
		• Describe the mechanism of formation of dilute urine. • Define and explain the term obligatory urine volume. • Explain the renal mechanism of conservation of water.
	Formation of concentrated urine	***At the end of lecture students should be able to:***

		• Explain the formation of concentrated urine by the kidneys.
		  ○ Describe the mechanism of production of hyperosmolar medullary interstitium.
		  ○ Describe counter current mechanism.
		  ○ Describe the role of urea in concentrating urine.
		  ○ Give the summary of tubular characteristics which play relevant role in concxentrating urine.
		  ○ Describe the role of vasa recta in preserving the

	Role of ADH	***At the end of lecture students should be able to:***

		• Give the sites of synthesis,mechanism of synthesis,stimuli for release ,roles and physiological effects of antidiuretic hormone in conserving water.
		  ○ Enumerate disorders of urine concentrating ability.
		  ○ Briefly explain these disorders.

	Concept of free water and osmolar clearances	***At the end of lecture students should be able to:***
		• Briefly describe the concept of free water and osmolar clearances.
	Extracellular fluid osmolarity and sodium concentration	***At the end of lecture students should be able to:***

		• Describe the control of extracellular fluid osmolarity and sodium concentration. • Explain the osmoreceptor – ADH feed back system. • Describe the relevant roles of o Thirst o Angiotensin II o Aldosterone o Salt appetite mechanism For controlling ECF osmolarity and sodium concentration.
5.	Renal Regulation of Potassium, Calcium, Phosphate, and Magnesium;	***At the end of lecture students should be able to:***
		• Describe the regulation ofexcretion and concentration in ECF of following ions. o Potassium o Calcium o Phosphate o Magnesium ▪ Give their normal values in ECF. ▪ Regulation of internal distribution. ▪ Overview of renal excretion. ▪ Summary of factors that regulate secretion and excretion.
	Integration of Renal Mechanisms for Control of Blood Volume and Extracellular Fluid Volume	***At the end of lecture students should be able to:***
		• Explain the integration of renal mechanisms for control of ECF volume. • Describe the importance of pressure natriuresis and diuresis in maintaining body sodium and fluid balance. • Describe the distribution of ECF between interstitial space and vascular system. • Enumerate and explain nervous and hormonal factors that increase the effectiveness of renal –body fluid feed back control. • Briefly describe the integrated response to changes in sodium intake. • Enlist and explain conditions that cause large increase in o Blood volume and ECF volume. o ECF volume but with normal blood volume.
6.	**BLOOD BUFFERS** Regulation of Acid-Base Balance	***At the end of lecture students should be able to:***
		• Define buffers. • Name buffer systems of the body. • To understand the mechanism of action of each buffer system of the body fluids
	Respiratory system in	***At the end of lecture students should be able to:***

	maintaining acid base balance	• To understand the buffering power of respiratory system. • Mechanism of development of respiratory acidosis. • To understand the mechanism of correction of acidosis and alkalosis.
	Role of kidneys in maintaining acid base balance	***At the end of lecture students should be able to:***
		• To understand the mechanism of o Excreting ,secreting and conserving hydrogen ions. o Excreting ,secreting and conserving bicarbonate ions. • To understand the mechanism of generation of new bicarbonate ions. • To understand the mechanism of correction of acidosis and alkalosis. • To understand the mechanism of development of clinical causes of common acid base disorders. o Define and explain anion gap.
7.	Diuretics	***At the end of lecture students should be able to:***
		• Classify diuretics. • Give their mechanism of action and tubular sites of action.
	Acute and chronic renal failure	***At the end of lecture students should be able to:***
		• Describe acute and chronic renal failure. o Enlist their causes. o Enumerate the types. o Give the physiologic effects. o Compare and contrast acute and chronic renal failure.
	Disorders	***At the end of lecture students should be able to:***
		• Explain hypertension caused by renal diseases. • Enumerate specific tubular disorders and explain each of these briefly.
	Fole of dialysis and renal transplant	***At the end of lecture students should be able to:***
		• Briefly describe the role of dialysis and renal transplant in the treatment of renal diseases.

LEARNING OBJECTIVES

LECTURES

2ND YEAR MBBS

ANATOMY

EMBRYOLOGY

Development of bodies cavities and diaphragm

At the end of the lectures on development of bodies cavities and diaphragm the students should be able to describe

1. List the adult body cavities and describe how they are formed from the embryonic coelom.
2. Describe the development of mesenteries.
3. Give the development of diaphragm
4. Describe the adult derivative of the pleuropericardial membranes
5. Describe how the serous membranes of each adult body cavity arise during development.

Development of pharyngeal apparatus, face and neck

At the end of the lectures on development of pharyngeal apparatus, face and neck the students should be able to describe

1. Give the pharyngeal arch components
2. Enlist the derivates pharyngeal pouches
3. How the pharyngeal grooves and pharyngeal membranes are formed.
4. Give the development of thyroid gland.
5. Describe the development of tongue along with its nerve supply.
6. Give the developmental stages of face.
7. Discuss the congenital anomalies of face.
8. Give the development of nasal cavities and paranasal sinuses.
9. Discuss the development of primary and secondary palat.
10. Discuss the cleft lip and cleft palate

Development of respiratory system

At the end of the lectures on development of respiratory system the students should be able to describe

1. Enumerate the different parts of respiratory system
2. Name the different parts of foregut
3. Discuss the formation of laryngo- tracheal tube
4. Discuss the formation of lung bud
5. Describe the branches of bronchi
6. Discuss the different stages of development of lung
7. Describe maturation of lung
8. Enumerate the congenital errors during development

Development of gastrointestinal tract

At the end of the lectures on development of gastrointestinal tract the students should be able to describe

1. Understanding of germ layer contributions to the early gastrointestinal tract (git)
2. Understanding of the folding of the git
3. Understanding of three main git embryonic divisions
4. Understanding of associated organ development (liver, pancreas, spleen)
5. Brief understanding of mechanical changes (rotations) during git development
6. Brief understanding of gastrointestinal abnormalities

Development of urogenital System

At the end of the lectures on development of urogenital system the students should be able to describe

1. Discuss the development of kidneys and ureters.
2. Give the development of urinary bladder and urethra
3. Give the development of supra renal glands
4. Discuss the congenital anomalies kidneys, ureters and urinary bladder.
5. Give the development of testis.
6. Discuss the development of uterus and ovaries.
7. Give the development of male and female genital ducts and glands.

Development of cardiovascular system

At the end of the development of cardiovascular system the students should be able to describe the

1. Early development of the heart and blood vessels
2. Later development of the heart
3. Anomalies of the heart and great vessels
4. Derivatives of the pharyngeal arch arteries
5. Fetal and neonatal circulation
6. Development of the lymphatic system

Development of skeletal system

At the end of the development of skeletal system the students should be able to describe the

1. Development of bone and cartilage
2. Development of joints
3. Development of the axial skeleton
4. Development of the appendicular skeleton
5. Generalized skeletal malformation

Development of muscular system

At the end of the development of skeletal system the students should be able to describe the

1. Development of skeletal muscle
   Myotome, pharyngeal arch muscle, tongue muscle and ocular muscles
2. Development of smooth muscles
3. Development of cardiac muscles

Development of Limbs

At the end of the development of skeletal system the students should be able to describe the

1. Early stages of limb development
2. Final stages of limb development
3. Cutaneous innervations of limbs
4. Blood supply of limbs.
5. Birth defects of limbs

Development nervous system

At the end of the development of nervous system the students should be able to describe the

1. Development of the nervous system
2. Development of the spinal cord
3. Development of spinal ganglia, meninges
4. Positional changes of spinal cord
5. Myelination of nerve fibers
6. Birth defects of spinal cord
7. Development of brain flexures, hind brain, midbrain, forebrain.
8. Birth defects of brain
9. Development of peripheral nervous system
10. Development of autonomic nervous system
11. Clinically oriented problems

Development Eyes and Ears

At the end of the development of nervous system the students should be able to describe the

1. Development of eye and related structures
2. Development of the ear
   Internal, middle and external ear
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Development of Integumentary System

At the end of the development of integumentary system the students should be able to describe the

1. Development of skin and skin appendages
2. Clinically oriented problems

Human birth defects

At the end of the development of human birth defects system the students should be able to describe the

1. Classification of birth defects
2. Study of abnormal development
3. Anomalies caused by genetic factors
4. Anomalies caused by environmental factors
5. Anomalies caused by multifactorial inheritance

SPECIAL HISOLOGY

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HISTOLOGY

The Circulatory System

At the end of the Lectures of Special Histology of circulatory system the students should be able to describe the

1. Heart
2. Tissues of the vascular wall
3. Vasculature
4. Lymphatic vascular system

Blood

At the end of the Lectures of Special Histology of Blood system the students should be able to describe the

1. Composition of plasma
2. Blood cells

Hemopoiesis

At the end of the Lectures of Special Histology of Hemopoiesis system the students should be able to describe the

1. Stem cells, growth factors,& differentiation
2. Bone marrow
3. Maturation of erythrocytes
4. Maturation of granulocytes
5. Maturation of agranulocytes
6. Origin of platelets

The Immune System & Lymphoid Organs

At the end of the Lectures of Special Histology of immune & lymphoid organs system the students should be able to describe the

1. innate & adaptive immunity

2. cytokines
3. antigens & antibodies
4. antigen presentation
5. cells of adaptive immunity
6. thymus
7. mucosa-associated lymphoid tissue
8. lymph nodes

Digestive Tract

At the end of the Lectures of Special Histology of Digestive Tract system the students should be able to describe the

1. General structure of the digestive tract
2. Oral cavity
3. Esophagus
4. Stomach
5. Small intestine
6. Large intestine

Organs Associated with the Digestive Tract

At the end of the Lectures of Special Histology of Organs Associated with the Digestive Tract system the students should be able to describe the

1. Salivary glands
2. Pancreas
3. Liver
4. Biliary tract & gallbladder

The Respiratory System

At the end of the Lectures of Special Histology of respiratory system the students should be able to describe the

1. Nasal cavities
2. Nasopharynx
3. Larynx
4. Trachea
5. Bronchial tree & lung

6. Lung vasculature & nerves
7. Pleural membranes
8. Respiratory movements

Skin

At the end of the Lectures of Special Histology of Skin system the students should be able to describe the

1. Epidermis
2. Dermis
3. Subcutaneous tissue
4. Sensory receptors
5. Hair
6. Nails
7. Skin glands
8. Skin repair

The Urinary System

At the end of the Lectures of Special Histology of urinary system the students should be able to describe the

1. Kidneys
2. Blood circulation
3. Renal function: filtration,secretion, & reabsorption
4. Ureters, bladder, & urethra

Endocrine Glands

At the end of the Lectures of Special Histology of Endocrine glands the students should be able to describe the

1. Pituitary gland (hypophysis)
2. Adrenal glands
3. Pancreatic islets
4. Diffuse neuroendocrine system
5. Thyroid gland
6. Parathyroid glands
7. Pineal gland

The Male Reproductive System

At the end of the Lectures of Special Histology of male reproductive system the students should be able to describe the

1. Testes
2. Intratesticular ducts
3. Excretory genital ducts
4. Accessory glands
5. Penis

The Female Reproductive System

At the end of the Lectures of Special Histology of Female reproductive system the students should be able to describe the

1. Ovaries
2. Uterine tubes
3. Major events of fertilization
4. Uterus
5. Embryonic implantation, decidua,& the placenta
6. Cervix
7. Vagina
8. External genitalia
9. Mammary glands

The Eye & Ear: Special Sense Organs

At the end of the Lectures of Special Histology of Special Sense organs system the students should be able to describe the

1. Eyes: the photoreceptor system
2. Ears: the vestibuloauditory system

DEPARTMENT OF BIOCHEMISTRY

LEARNING OBJECTIVES

Learning objectives 2nd Year

01. Energy Metabolism

(a) Biochemical anatomy of mitochondria.
(b) High energy and low energy compounds with examples.
(c) Concept of oxidation and reduction.
(d) ETC (5) ATP generation, inhibitors and uncouplers of ETC.
(e) Congenital anomalies related with mitochondria.

02. GIT

(a) Composition and functions of different GIT secretions (Saliva, gastric juice, bile pancreatic juice and success intericus).
(b) Digestion and absorption of Macromolecules (carbohydrates, proteins, lipids and nucleic acids.
(c) Various clinical disorders related with their metabolism.

03. Carbohydrates Metabolism

(a) Glucose and glycogen metabolism
(b) Gluconeogenesis
(c) Regulation of blood glucose level.
(d) HMP and use of NADPH and their relation with different clinical condition
(e) Uronic acid pathway and uses of glucuronic acid.
(f) Metabolism of fructose, galactose and lactose and their disorders.

04. Protein metabolism

(a) Concept of amino acid pool, protein turn over and nitrogen balance.
(b) Entry of amino acid into cell and related disorder.
(c) Reaction of amino acid their related disorders.
(d) Urea cycles and its regulation
(e) Urea cycle disorder
(f) Production of ammonia and its toxicity.
(g) Metabolism of individual amino acids and their related disorders.

05. Lipids Metabolism.

(a) Metabolism of neutral fats fatty acids, phospholipids, glycolipids and lipoproteins and related disorders.

(b) Metabolism of ketone bodies and its clinical relation with diabetes Mallitus and starvation.
(c) Metabolism of cholesterol and related disorders.
(d) Metabolism of Ecosanoids
(e) Fatty liver.

06. Metabolism of Nucleic acids.

(a) Concept of replication of chromosomes and its disorders.
(b) Concept of transcription and translation and their clinical correlation.
(c) Mutation and their relationship with diseases
(d) Biotechnologies and its relationship with diagnosis and production of medicines.

07. Acid base imbalance.

(a) Concept of acid base imbalance and its significance
(b) Concept of anion gap
(c) Concept of arterial blood gases in clinical diagnosis.

08. Water and Electrolyte imbalance.

(a) Concept of overhydration and dehydration.
(b) Concept of Na, K and cl ion and their elevated and decreased levels.

09. ENDOCRINES.

(a) Concept of biochemical classification, general mechanism of action of various hormones.
(b) Concept of mechanism of Biochemical role of individual hormones
(c) Mutation and their relationship with diseases.