

SAHARA MEDICAL COLLEGE NAROWAL

**MODULAR INTEGRATED
STUDY GUIDE 2023-2024**

GIT & NUTRITION-I

2nd YEAR MBBS

BLOCK-4

NORMAL STRUCTURE			
THEORY			
Sr.no	GROSS ANATOMY	TOTAL HOURS = 35	
	SPECIFIC LEARNING OUTCOMES	DISCIPLINE	TOPIC
01	Describe the gross anatomical features of oral cavity with its neurovascular supply and lymphatic drainage	Human Anatomy	Oral Cavity and Oropharynx
	Discuss the location, anatomical features, relations and vascular supply of tonsils: nasopharyngeal, palatine and lingual.		
	Discuss the skeletal framework of hard palate with its neurovascular supply and lymphatic drainage		
	Describe the gross anatomical features of soft palate with its neurovascular supply and lymphatic drainage		
	Describe the attachments, nerve supply and actions of muscles of soft palate		
	Describe the structure of tongue with attachments of muscles, blood supply, nerve supply and lymphatic drainage		
	Discuss the anatomical basis of injury to hypoglossal		
	Describe anatomical features, relations and neurovascular supply of parotid gland and its duct, mentioning the structures entering and exiting the gland.		
	Discuss the clinical correlates of parotid gland: parotiditis, Mumps, Frey's syndrome, parotid duct injury and parotid tumor surgery with its complications.		
	Describe the Waldeyer's ring.		
	Describe anatomical features, relations and neurovascular supply of submandibular and sublingual glands with their ducts.		

Name the parts of pharynx giving their extent, anatomical		
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	<p>features, structure, neurovascular supply and Lymphatic drainage</p> <p>Name the pharyngeal constrictor muscles defining their attachments, innervation and structure traversing the gaps between adjacent muscles.</p>		
02	<p>Describe the planes and quadrants of abdomen</p> <p>Draw and label the cutaneous innervation and dermatomes of anterior abdominal wall and anterolateral Abdominal wall and describe the clinical correlates (Abdominal pain, Muscle rigidity, Referred pain, anterior abdominal nerve block)</p> <p>Describe the fascia of anterior abdominal wall with its clinical significance</p> <p>Describe anterolateral Abdominal wall arteries, Veins and Lymphatics and related clinical correlates—Caput</p> <p>Describe the attachments, nerve supply and actions of muscles of anterior abdominal wall</p> <p>Identify the muscles of anterolateral abdominal wall on anatomical model and/or cadaver</p> <p>Describe the extent, formation and contents of rectus sheath</p> <p>Give the formation and extent of inguinal ligament</p> <p>Describe the formation of superficial and deep inguinal rings and conjoint tendon</p> <p>Locate the position of superficial and deep inguinal rings on simulated subject or Cadaver</p> <p>Describe the extent, boundaries and contents of inguinal canal</p> <p>Define the following hernias: umbilical, epigastric, incisional, Spigelian, lumbar, femoral, internal and inguinal</p>	Human Anatomy	Anterior Abdomen Wall

	Differentiate between direct and indirect inguinal hernias		
	Describe the location of abdominal surgical incisions		
	Mark the abdominal incisions on simulated patient/		
	List the structures and coverings of spermatic cord		
04	Trace the horizontal and vertical peritoneal reflections		Peritoneum
	Describe the relationship of viscera to the peritoneum		
	Describe the gross anatomical features of the following: <ul style="list-style-type: none"> 1. Mesentery 2. Omentum 3. Peritoneal ligaments 4. Peritoneal fold 		
	Describe the nerve supply of Peritoneum		
	Describe the anatomical basis and manifestations of the following: <ul style="list-style-type: none"> 1. Peritonitis and ascites 2. Peritoneal adhesions (and adhesiostomy) 		
05	Describe the extent of esophagus, its constrictions, neurovascular supply and lymphatic drainage	Human Anatomy	Esophagus
06	Describe the location, position, parts, external and internal structure, relations, vascular and nerve supply and lymphatic drainage of stomach	Human Anatomy	Stomach
	Draw and label a diagram illustrating the lymphatic drainage of Stomach		

	Describe the clinical presentation and the anatomical basis and manifestations of the following conditions: Carcinoma of stomach and peptic ulcers		
	Identify and demonstrate the parts, external and internal features of stomach on anatomical model and cadaver		
07	Describe the location, position, parts, relations, neurovascular supply and lymphatic drainage of duodenum	Human Anatomy	Small & Large Intestine
	Describe the anatomical basis and manifestations of the following conditions: 1. Duodenal Ulcers 2. Ileal diverticulum 3. Diverticulosis 4. Large bowel cancer		
	Demonstrate the various positions of appendix		
	Identify and demonstrate the Parts and external features of small and large intestines on anatomical model and cadaver		
08	Describe the origin, course, branches (tributaries in case of veins) and distribution of the blood vessels of GIT	Human Anatomy	Liver
	Describe the formation, tributaries and drainage of hepatic-portal vein		
	Discuss the sites and vessels contributing in portosystemic anastomosis		
	Describe the clinical picture and anatomical basis for the blockage of porto-systemic anastomosis		
	Identify the blood vessels supplying GIT on anatomical model and cadaver		
	Describe location, lobes, important relations, peritoneal ligaments, blood supply, lymphatic drainage, nerve	Human	Liver

	supply, related clinical correlates of liver and subphrenic spaces.		
09	Describe components of Biliary tree- hepatic duct and bile duct	Human Anatomy	Biliary System
	Describe relations, functions, blood supply, lymphatic drainage and nerve supply of Gallbladder		
	Describe related clinical correlates- gall stones, biliary colic, cholecystectomy, gallbladder gangrene		
10	Describe the location, surfaces, peritoneal reflections, relations, neurovascular supply and lymphatic drainage of pancreas	Human Anatomy	Pancreas
	Describe the anatomical basis and manifestations of pancreatitis and pancreatic cancer		
	Identify the parts of the pancreas		
11	Describe the location, surfaces, peritoneal reflections, relations, neurovascular supply and lymphatic drainage of spleen	Human Anatomy	Spleen
	Describe the anatomical basis and manifestations of splenic trauma and splenomegaly		
	Identify the borders, surfaces and Impressions of spleen		
	Demonstrate the correct anatomical positioning of spleen		
12	Describe the gross anatomical features, peritoneal relations, blood supply, nerve supply and lymphatic drainage of sigmoid colon, rectum and anal canal	Human Anatomy	Sigmoid Colon, Rectum & Anal Canal
	Describe the anatomical basis for Sigmoidoscopy, rectal prolapse, rectal examination, rectal cancer and hemorrhoids		
13	Outline the anatomical basis and surgical treatment plan for the following diseases: 1. Esophageal Injuries	Human Anatomy integrated with Surgery	Surgical Intervention

	3. Intestinal Obstruction 4. Pancreatic Carcinoma 5. Obstructive Jaundice		
	EMBRYOLOGY & POST-NATAL DEVELOPMENT	TOTAL HOURS = 08	
Sr.no	SPECIFIC LEARNING OUTCOMES	DISCIPLINE	TOPIC
14	Describe the development of tongue	Embryology	Oral Cavity
	Describe the embryological basis of tongue tie		
	Describe the development of palate		
	Describe the embryological basis of various facial clefts		
	Identify the parts of the developing tongue and palate		
15	Describe the formation and divisions of gut tube	Embryology	Foregut
	Describe the development of mesenteries		
	Describe the development of esophagus		
	Describe the embryological basis of esophageal atresia and/or tracheoesophageal fistula		
	Describe the development and rotation of stomach		
	Describe the embryological basis of pyloric stenosis		
	Describe the development of duodenum, liver and gall bladder		
	Describe the embryological basis of intrahepatic and extrahepatic biliary atresia		
	Describe the development of pancreas		
Describe the embryological basis of annular pancreas			
16	Describe the development of midgut especially mentioning physiological herniation, rotation, retraction of herniated loops and mesenteries of the intestinal loops	Embryology	Midgut
	Describe the embryological basis of the following 1. mobile cecum 2. volvulus		

	5. gastroschisis		
	Describe the embryological basis of Meckel's diverticulum		
	Describe the embryological basis of;		
	1. Gut rotation defects		
	Describe the development of hindgut		
	Describe the embryological basis of;		
	3. Rectourethral and rectovaginal fistulas		
	4. Recto anal fistulas and atresia		
17	Identify the parts of the developing foregut, midgut and hindgut originating from the endoderm	Embryology	Hindgut
	MICROSCOPIC ANATOMY (HISTOLOGY & PATHOLOGY)	TOTAL HOURS = 07	
Sr.no	SPECIFIC LEARNING OUTCOMES	DISCIPLINE	TOPIC
	Describe the light microscopic structure of;		
	1. Lips		
	2. Tongue including lingual papillae and taste buds		
	3. Oral Cavity (Cheeks, Teeth gums, hard & Soft palate)		
	Describe the histological structure of parotid, submandibular and sublingual glands.		
	Compare and contrast the histological structures of parotid, submandibular and sublingual glands.		
18	Relate the characteristics of various layers of GIT with	Histology	Oral Cavity & Esophagus

	their function		
	Describe the light microscopic structure of esophagus		
	Tabulate the histological differences between different parts of esophagus		
	Describe the histological changes associated with reflux esophagitis and Barrett's esophagus		
19	Describe the light microscopic structure of stomach	Histology	Stomach
	Describe the role of parietal cells in pernicious anemia		
20	Describe the light microscopic structure of 1. Duodenum 2. Jejunum	Histology	Small Intestine
	Discuss the histological basis of celiac disease		
	Discuss the histological basis of Crohn's disease		
21	Describe the light microscopic structure of 1. Colon	Histology	Large Intestine
	2. Appendix		
PRACTICAL			
	HISTOLOGY	TOTAL HOURS = 12	
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
22	Identify, draw and label the histological sections of	Histology	Oral Cavity
23	Identify, draw and label the histological sections of	Histology	Salivary
24	Identify, draw and label the histological structure of the esophagus and enumerate points of identification	Histology	Upper GIT
	Identify, draw and label the histological structure of	Practical	

25	Identify, draw and label the histological structure of small intestine (Duodenum, Jejunum, and Ileum) and enumerate points of identification	Histology Practical	Small Intestine
26	Identify, draw and label the histological structure of large intestine and enumerate points of identification	Histology Practical	Large Intestine
27	Identify, draw and label the histological sections of Gall bladder, liver and enumerate points of identification	Histology Practical	Organs associated with GIT
	Identify, draw and label the histological sections of pancreas and enumerate points of identification	Histology Practical	Organs associated with GIT
28	Identify, draw and label the histological sections of Palatine tonsil, appendix, peyer's patches and enumerate points of identification	Histology Practical	Lymphatic tissue associated with GIT
NORMAL FUNCTION			
THEORY			
Sr.no	MEDICAL PHYSIOLOGY	TOTAL HOURS = 20	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
01	Classify the components of enteric nervous system	Medical Physiology	General Principles of GIT Function - Motility, Nervous Control & Blood Flow
	Discuss the location and significance of myenteric plexus		
	Describe the Meissner's plexus		
	Differentiate between myenteric and Meissner's plexuses		
	Explain the mechanism of developing slow wave		
	Explain the mechanism of developing spike potential		
	Enlist the factors that depolarize & hyperpolarize the GIT		
	Enlist the excitatory & inhibitory neurotransmitters of enteric nervous system		
	Explain the role of sympathetic & parasympathetic nervous system in controlling GIT function.		
	Enlist the gastrointestinal reflexes & explain the functions of these reflexes		

	Enlist the hormones acting on GIT, their stimuli, site of release and actions		
	Enumerate different types of movements that occur in GIT		
	Discuss the functions and control of GIT movements		
	Discuss the effect of gut activity and metabolic factors on		
	Explain the nervous control of GIT blood flow		
02	Trace the reflex arc of mastication	Medical Physiology	Oral Cavity & Esophagus
	Explain the process and importance of chewing reflex		
	Enlist the stages of swallowing		
	Describe the mechanism of voluntary stage of swallowing		
	Trace the reflex arc of involuntary stage of swallowing		
	Enlist the steps involved in involuntary stage of swallowing	Medical Physiology	
	Explain the effect of swallowing on respiration	Medical Physiology	
	Discuss the mechanism of esophageal stage of swallowing	Medical Physiology	
	Enlist causes of dysphagia	Medical Physiology integrates with Surgery	
	Explain the types and role of different peristalsis originating in esophagus	Medical Physiology	
	Discuss the role of Lower Esophageal Sphincter (Gastroesophageal)	Medical Physiology	
	Discuss the pathophysiology of achalasia & Megaesophagus	Medical Physiology	
Enlist the features and treatment of achalasia	Medical Physiology		

03	Explain storage function of stomach	Medical Physiology	Stomach
	Describe the basic electrical rhythm of stomach wall	Medical Physiology	
	Explain the role of pyloric pump and pyloric sphincter in gastric emptying	Medical Physiology	

	Explain the factors that promote Stomach Emptying	Medical Physiology	
	Discuss the duodenal (nervous & hormonal) factors that inhibit Stomach emptying	Medical Physiology	
	Enlist the factors that initiate enterogastric inhibitory reflexes	Medical Physiology	
	Enumerate the causes, features, and pathophysiology of gastritis	Medical Physiology integrates with Medicine	
	Explain the physiological basis of each feature of gastritis	Medical Physiology integrates with Medicine	
	Recommend treatment of gastritis		
	Enumerate the causes, features, and pathophysiology of peptic ulcer	Medical Physiology integrates with Medicine	
	Explain the physiological basis of each feature of peptic ulcer		
04	Enumerate and explain the hormones and movements of small intestine		Small Intestine
	Explain the term "peristaltic rush"	Medical	
	Explain the functions of ileocecal valve and sphincter	Physiology	
	Enumerate the types of intestinal sprue	Medical	
	Enlist the features of intestinal sprue	Physiology integrates with Medicine	
	Explain the consequences of sprue on the body		
	Enumerate the types of movements taking place in colon	Medical Physiology	

05	Explain the mechanism of developing movements of colon and their control through Gastrocolic and Duodenocolic Reflexes	Medical Physiology	Large Intestine
	Enlist the defecation reflexes	Medical Physiology	
	Explain the mechanism of defecation reflex	Medical Physiology	
	Trace the reflex arc of defecation	Medical	

		Physiology	
	Name the other autonomic reflexes that affect bowel activity	Medical	
	Explain the pathophysiology of constipation	Medical Physiology integrates with Medicine	
	Discuss the causes of diarrhea	Medical	
	Describe the cause of Hirschsprung's disease integrate	Physiology	
06	Explain the functions of liver	Medical Physiology	Liver
	Differentiate between liver and gall bladder bile and the hormones acting on them	Medical Physiology	
	Enumerate the causes and composition of developing gall stones	Medical Physiology Integrate with Surgery	
07	Explain function and secretions of pancreas	Medical Physiology	Pancreas
	Enlist the causes and pathophysiology of acute and chronic pancreatitis	Integrate with Medicine	
	Enumerate the features of acute pancreatitis and explain the physiological basis of each feature of pancreatitis	Integrate with Medicine	
08	Describe the stages of vomiting act	Medical Physiology	Vomiting Reflex
	Trace the reflex arc of vomiting	Medical Physiology	
	Explain the role of chemoreceptor trigger zone for initiation of vomiting by drugs or by motion sickness	Medical Physiology	
	Define Malnutrition		
	Identify various causes of malnutrition		
	Identify the risk factors of malnutrition		

	Outline treatment strategies		
	Define Acute Diarrhea	Integrated with Medicine Gastroenterology	Acute & Chronic Diarrhea
10	Define Chronic Diarrhea		

	Enlist various causes for acute and chronic diarrhea		
	BIOCHEMISTRY	TOTAL HOURS = 40	
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
01	<p>Give the composition and importance of saliva and related clinical disorder (xerostomia)</p> <p>Give the composition and importance of gastric juice with special reference to mechanism of HCl secretion and related clinical disorders (achlorhydria, gastric ulcer)</p> <p>Give the composition and importance of pancreatic juice, bile and succus entericus and related clinical disorders (pancreatitis, cystic fibrosis, cholelithiasis).</p> <p>Describe digestion and absorption of dietary carbohydrates along with inherited and acquired disorders (lactose intolerance, sucrase-isomaltase deficiency).</p>	Biochemistry	Biochemistry of GIT /GIT secretions & digestion and absorption of dietary carbohydrates
02	Elaborate key features of various transport systems for entry of glucose into cells.	Biochemistry	Carbohydrate metabolism/ Entry of glucose into cells
03	<p>Enlist the hormones that play important roles in regulating carbohydrate metabolism.</p> <p>Elaborate the metabolic effects of these hormones.</p> <p>Infer the consequences of deficiency and excess of these hormones</p>	Biochemistry	Carbohydrate metabolism/ Hormonal control of BSL
04	<p>Describe the glycolytic pathway along with its regulation and significance.</p> <p>Compare key features of aerobic and anaerobic glycolysis.</p> <p>Calculate the number of ATP produced during aerobic and anaerobic glycolysis.</p> <p>Explain hemolytic anemia in subjects with pyruvate kinase deficiency based on your biochemical knowledge.</p>	Biochemistry	Carbohydrate metabolism/ Glycolysis

	Clearly differentiate between substrate level phosphorylation and oxidative phosphorylation.		
05	Discuss the metabolic fates of pyruvate.	Biochemistry	Carbohydrate metabolism/ Metabolic fates of pyruvate
	Describe the transport of pyruvate from cytosol to mitochondria.		
	Elaborate the reaction catalyzed by pyruvate dehydrogenase complex (PDH) along with regulation and significance.		
	Enlist inherited and acquired causes of lactic acidosis and give biochemical explanation for lactic acidosis in each condition.		
06	Describe the TCA cycle along with regulation &	Biochemistry	Carbohydrate metabolism/ Kreb's Cycle
07	Define gluconeogenesis and enumerate gluconeogenic substrates (precursors)	Biochemistry	Carbohydrate metabolism/ Gluconeogenesis
	Delineate the reactions involved in synthesis of glucose from various gluconeogenic substrates.		
	Elaborate the regulation and importance of gluconeogenesis.		
	Explain the significance of Cori cycle and glucosealanine cycle		
08	Illustrate the reactions of glycogenesis, glycogenolysis along with their regulation and significance	Biochemistry	Carbohydrate metabolism/ Glycogen metabolism
	Enlist various types of glycogen storage diseases (GSDs)		
	Infer the key biochemical and clinical features of various		
09	Describe the reactions and regulation of Hexose Mono	Biochemistry	Carbohydrate metabolism/ HMP Hexose Monophosphate
	Discuss the importance of HMP shunt		
	Explain hemolytic anemia in subjects suffering from		

	G6PD deficiency.		
	Diagnose G6PD (glucose-6-phosphate dehydrogenase)		
10	Describe the reactions, regulation, and biomedical importance of uronic acid pathway and sorbitol pathway	Biochemistry	Carbohydrate metabolism/ Uronic acid pathway & sorbitol pathway
	Outline the reactions involved in metabolism of galactose and fructose.		
	Infer the key biochemical and clinical features of galactosemia, essential fructosuria, and hereditary fructose intolerance (HFI) from the respective enzyme deficiencies.		
11	Explain hypertriacylglycerolemia, hypercholesterolemia, and hyperuricemia associated with fructose loading of liver.	Biochemistry	Carbohydrate metabolism/ Metabolism of galactose & fructose
	Outline the reactions involved in ethanol metabolism.		
12	Explain how ethanol consumption causes hypoglycemia and fatty liver.	Biochemistry	Carbohydrate metabolism/ Ethanol metabolism
	Diagrammatically illustrate the organization of electron transport chain (ETC) depicting the flow of electrons		
	Enlist the components of complex I, II, III, and IV		
13	Enumerate clinically important inhibitors of electron transport chain and mention their site of action.	Biochemistry	Respiratory chain & oxidative phosphorylation
	Elaborate the structure of ATP synthase (complex V).		
	Explain how the free energy generated by the transport of electrons by ETC is used to produce ATP from ADP + Pi (i.e. chemiosmotic hypothesis)		
	Elaborate the effect of oligomycin and uncouplers on ATP		
14	Describe the effect of arsenic poisoning on carbohydrate metabolism and ATP production.	Biochemistry	Respiratory chain & oxidative phosphorylation /ATP
	Elaborate the glycerol 3-P shuttle and malate-aspartate		

	shuttle for the transfer of reducing equivalents from cytosol into the mitochondria.		
15	Define and classify nutrients into macro and micronutrients.	Biochemistry	Nutrition/ Balanced diet
	Elaborate the concept and importance of Balanced Diet		
	Enlist the components of balanced diet and elaborate the importance of each component.		
16	Delineate special nutritional requirements during pregnancy, lactation, growth, and old age.	Integrate with Community Medicine	Nutrition/ Special nutritional requirements
	Suggest dietary advice for patients suffering from diabetes mellitus, hypertension, obesity, renal disease, lactose intolerance, gluten enteropathy, hypercholesterolemia, and hemorrhoids.		
17	Enlist causes and types of Protein Energy Malnutrition	Integrate with community Medicine/ Pediatrics	Nutrition/ PEM
	Differentiate between Kwashiorkor and Marasmus based on the given data		
	Enlist symptoms and signs		
18	Define energy balance.	Biochemistry	Nutrition/ Caloric requirements
	Compare the energy content of macro nutrients and alcohol.		
	Suggest a simple method for estimation of caloric requirements of sedentary adults, moderately active adults, and very active adults		
19	Define basal metabolic rate (BMR)	Biochemistry	Nutrition/ BMR
	Elaborate the effect of various physiological and pathological factors on BMR.		
20	Define body mass index (BMI).	Integrate with community Medicine	Nutrition/ BMI & Obesity
	Categorize individuals into underweight, normal, overweight, obese, and morbidly obese based on their BMI values.		

	Elaborate the role of genetic, environmental, and behavioral factors in determining body weight.		
	Clearly differentiate between upper body obesity and lower body obesity.		
	Enlist health risks associated with obesity.		
21	Describe sources, Recommended Dietary Allowance (RDA), biochemical functions, deficiency, and toxicity of vitamin B1, B2, B3, B5 and B7.	Biochemistry	Vitamins/ Energy releasing vitamins & vitamin E and K
	Describe sources, RDA, biochemical functions, deficiency, and toxicity of vitamin E and vitamin K.		
22	Define and classify minerals according to their daily requirements.	Biochemistry	Minerals
	Give sources, functions and biomedical importance of Na, K and Cl.		
	Describe sources, functions and biomedical importance of		
23	Define Marasmus and Kwashiorkor	Integrated with Pediatrics	Malnutrition
24	Define Acute Hepatitis	Integrated with Medicine Gastroenterology	Acute & Chronic Hepatitis
	Define Chronic Hepatitis		
	Enlist various causes for acute and chronic hepatitis		
	Describe various symptoms and signs of chronic hepatitis		
	Outline treatment strategies		
	PRACTICAL		
Sr.no	BIOCHEMISTRY	TOTAL HOURS = 11+06	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
25	Estimate blood glucose level by glucose oxidase method and interpret the results	Biochemistry Practical	Estimations of blood/urine analytes
	Determine blood glucose level by glucometer and		

	interpret the result.		
	Perform Glucose tolerance test (GTT) and interpret the results.		
	Determine urine glucose by dipstick method and interpret the result.		
	Estimate serum amylase and interpret the result.		
26	Interpret the results of Lactose tolerance test.		Interpretation of results
27	Determine BMI of given subject and interpret the results.		Determination & interpretation
11	Demonstrate Cranial nerve V, IX & X testing	Physiology	Cranial nerve
AGING			
	THEORY	TOTAL HOURS = 01	
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
	Identify causes and risk factors for malnutrition in elderly		Preventive Medicine in Geriatrics
01	Outline treatment strategies	Community Medicine	
PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS			
		TOTAL HOURS = 03	
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
01	Classify anti diarrheal drugs and describe the pharmacokinetics, mechanism of action, pharmacological effects, uses and adverse effects	Pharmacology	Anti Diarrheal Drugs
01	Describe the etiology, pathogenesis, morphology and clinical features of peptic ulcer disease	Pathology	Peptic Ulcer
02	Enumerate common infectious agents of diarrheal diseases Discuss pathogenesis and clinical features of common pathogens	Pathology	Infectious agents causing Diarrhea

DISEASE PREVENTION & IMPACT							
Sr.no	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 09					
		DISCIPLINE	TOPIC				
01	Identify health related behaviors and apply principles of learning to modify eating and addictive patterns	Behavioral Sciences	Health related behaviors				
02	Discuss health belief model and its application in managing common presentations related to gastro-intestinal system		Behavioral Sciences	Health related believes			
	Explain the transtheoretical model of changing behaviors to modify the diseases pattern						
03	Describe motivational interviewing and outline a management plan to help the individuals with obesity and diabetes to lose weight			Behavioral Sciences	Management of Obesity		
04	Describe and distinguish Medically Un described				Behavioral Sciences	Medically Un described Symptoms	
	Describe the association of psychosocial factors with						
	Outline the principles of management plan according to biopsychosocial model						
	Describe role of Cognitive Behavioral Therapy (CBT)						
05	To identify effect on mental development of nutritional deficiencies					Behavioral Sciences	Role of nutritional deficiencies in mental development
01	Describe prevention and control of polio, viral hepatitis A, cholera, typhoid and food poisoning						Community Medicine
	Describe prevention and control of amoebiasis, ascariasis, hook worm infestation						
02	Describe the advice to be given for breast feeding, weaning and childhood	Community Medicine	Preventive medicine in pediatrics				
	Discuss risk factors, prevention and management of protein energy malnutrition (PEM)						

03	Describe balanced diet for adult and obesity		Nutrition & Health
	Plot and interpret growth chart for children under 5 years of age		
	Describe prevention and control of deficiency of Vitamin A		

RENAL-I

NORMAL STRUCTURE			
THEORY			
Sr.no	GROSS ANATOMY	TOTAL HOURS = 14	
	SPECIFIC LEARNING OUTCOMES	DISCIPLINE	TOPIC
01	Describe gross features and facial coverings of kidneys.	Human Anatomy	Kidney
	Compare and contrast the relations of right and left kidneys.		
	Describe blood supply, lymphatics and nerve supply of kidney		
	Discuss the clinical aspects of kidneys		
	Demonstrate the surface marking and radiographic anatomy of kidney. Identify the side of kidney		
02	Compare and contrast the relations of right and left ureter	Human Anatomy	Ureter
	<u>Give the constrictions of ureter</u>		
	Describe the blood supply nerve supply and lymphatics of ureter		
	Identify the ureter.		
03	Describe the gross anatomical features, relations, surfaces, blood supply, nerve supply and lymphatics of urinary bladder	Human Anatomy	Urinary bladder
	<u>Give the clinical correlates of urinary bladder</u>		
	Identify the gross features and surfaces of urinary bladder		

04	Interpret basic urological signs/symptoms &		Sign/symptom/investigations
05	Describe the etiology, and management of urinary retention.	Integrate with urology	Urinary retention
06	Identify and describe the various anatomic landmarks of the renal system on	Integrate with Radiology	radiograph

	radiographs.		
07	Describe the parts of urethra.	Human Anatomy	Urethra
	EMBRYOLOGY & POST-NATAL DEVELOPMENT	TOTAL HOURS = 05	
Sr.no	SPECIFIC LEARNING OUTCOMES	DISCIPLINE	TOPIC
08	Describe development of intermediate mesoderm and its derivatives	Embryology	Development of urinary system
	Describe the development of pronephros, mesonephros and metanephros	Embryology	
	Describe positional changes during descent of kidney with correlation to its blood supply	Embryology	
	Describe the development of urinary bladder and urethra	Embryology	
	List and describe the common congenital anomalies of kidney, urinary bladder and urethra.	Embryology	
	MICROSCOPIC STRUCTURE	TOTAL HOURS = 04	
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
09	Describe the histological, structural organization and functions of kidney with clinicals.	Histology	Structure of kidney
10	Describe the light and ultrastructure of Juxtaglomerular apparatus and glomerular filtration barrier	Histology	Juxtaglomerular apparatus
11	Describe the histological structure of ureter	Histology	Structure of ureter
12	Describe the histological structure of urinary bladder Discuss clinical correlates (Cystitis, Urinary bladder cancer, Urinary Tract Infections (UTIs))	Histology	Structure of urinary bladder

PRACTICAL

HISTOLOGY				TOTAL HOURS = 06	
CODE	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC		
13	Identify and draw and label the histological structure of kidney and enumerate points of identification	Practical	Kidney		
14	Identify, draw and label the histological structure of ureter and enumerate its points of identification	Practical	Ureter		
15	Identify, draw and label the histological structure of urinary bladder and enumerate its points of identification	Practical	Urinary bladder		
NORMAL FUNCTION					
THEORY					
MEDICAL PHYSIOLOGY			TOTAL HOURS = 36		
Sr.no	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC		
01	Describe major composition of intracellular and extracellular fluids	Physiology	Body fluid compartment		
	Define Hypo and hypernatremia				
	Explain the causes of hypo & hypernatremia and their effects on Composition of body fluid compartments				
	Describe difference between iso-osmotic, hyper-osmotic, hypo-osmotic fluids				
02	Enumerate causes of Intracellular and extracellular edema	Integrate with Medicine	Edema		
	Describe safety factors that prevent edema				
03	Explain the functions of the kidney	Physiology	Function		
04	Describe the mechanism of micturition and its control		Micturition reflex		

	<p>Explain the role of higher center on micturition</p> <p>Explain the physiological anatomy and innervation of bladder</p> <p>Discuss the voluntary control of micturition</p>		
05	<p>Explain the causes, pathophysiology, and features of atonic bladder.</p> <p>Discuss the causes, pathophysiology, and features of automatic bladder.</p> <p>Write the causes, pathophysiology, and features of</p>	Integrate with Pathology	Abnormalities of micturition
06	<p>Enlist the steps of urine formation</p> <p>Explain the physiological anatomy and functions of glomerular capillary membrane</p> <p>Discuss the composition of filtrate</p> <p>Explain the minimal change nephropathy and increase permeability to plasma protein</p>	Physiology	Urine formation
07	<p>Define Glomerular Filtration Rate (GFR).</p> <p>Describe the determinants of GFR</p> <p>Explain the factors affecting GFR</p> <p>Discuss the hormones and autocooids that affect</p> <p>Explain mechanisms of autoregulation of GFR</p> <p>Enlist the physiological and pathological factors that decrease GFR</p> <p>Explain the effects of angiotensin II blocker on GFR</p>	Physiology	Glomerular filtration
08	<p>Enumerate different types of transport along the kidney tubules for reabsorption</p> <p>Explain the reabsorption and secretion along different parts of the Nephron</p> <p>Explain the regulation of tubular reabsorption</p> <p>Discuss the forces / pressure and hormones that</p>	Physiology	Reabsorption

	determine renal tubular reabsorption		
	Explain the reabsorption of water along different parts of nephron		
	Define obligatory and facultative reabsorption		
	Discuss the characteristics of late distal tubules and cortical collecting ducts		
	Discuss the characteristics of medullary collecting ducts		
09	Explain the use of clearance method to quantify kidney function	Physiology	Clearance method
	Describe mechanism of re-absorption of sodium along different parts nephrons		
	Define and explain the term Transport maximum for the substances		
	Define filtered load for the substance		
10	Justify the difference of transport maximum and renal threshold of glucose in renal tubules	Physiology	Transport maximum
	Explain the renal mechanisms for excreting		
	Explain the mechanism for forming a concentrated urine		
	Discuss the role of urea in the process of counter current multiplier mechanism		
11	Describe the countercurrent exchange in vasa	Physiology	Urine concentration and dilution
	Define and explain the term obligatory urine volume.		
	Define and explain free water clearance.		
12	Define Urine specific gravity.	Physiology	Obligatory urine volume
	Enumerate different abnormalities of urinary concentrating ability		
13		Physiology	Disorders of urine concentrating ability
14	Enumerate the types of Diabetes insipidus	Integrate with	Diabetes

	Enlist the features of diabetes insipidus	Medicine	insipidus	
	Explain the pathophysiology and treatment of central diabetes insipidus			
	Discuss the pathophysiology of nephrogenic diabetes insipidus			
15	Make the flow chart to show the Osmoreceptor-antidiuretic hormone (ADH) feedback mechanism for regulating extracellular fluid osmolarity in response to a water deficit.	Physiology	Osmoreceptor-ADH Feedback System	
	Enlist the factors which increase and decrease the release of ADH			
16	Explain the mechanism of thirst	Physiology	Thirst	
17	Enumerate the factors that can alter potassium distribution between intracellular and extracellular fluids		Renal regulation of potassium	
	Discuss the process of secretion of potassium by renal tubules			
	Explain the regulation of internal potassium distribution and potassium secretion			
18	Explain the control of extracellular fluid osmolarity and sodium concentration			Control of ECF
19	Explain the integration of renal mechanism for control of Extracellular Fluid (ECF)			Control of ECF
	Explain the importance of pressure natriuresis and diuresis in maintaining body sodium and fluid balance			
20	Explain the renal handling of calcium concentration to regulate plasma calcium concentration	Physiology		Renal regulation of calcium Renal regulation of phosphate
	Enumerate the factors that alter renal calcium			
	Enlist the factors that alter renal phosphate excretion			

21	Explain the nervous and hormonal factors that increase the effectiveness of renal body fluid feedback control	Physiology	Renal body fluid feedback control
22	Explain the conditions that cause large increase in blood volume and ECF volume		ECF and blood volume
	Explain the conditions that cause large increase		
23	Explain the renal handling of H ⁺ ion.	Acid base balance	
24	Analyze the acid base disturbances on the basis of pH, HCO ₃ and CO ₂	Physiology	Acid base disturbance
	Explain the causes and compensation of metabolic acidosis		
	Explain the causes and compensation of metabolic alkalosis		
	Explain the causes and compensation of respiratory acidosis		
	Explain the causes and compensation of respiratory alkalosis		
	Explain the causes and compensation of mixed acid base disorder		
25	Define and explain anion gap	Physiology	Anion gap
Sr.no	MEDICAL BIOCHEMISTRY	TOTAL HOURS = 23	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
01	Describe digestion and absorption of dietary proteins along with the inherited and acquired disorders (peptic ulcer, Hartnup disease, gluten enteropathy and cystic fibrosis). Elaborate the mechanisms involved in renal reabsorption of amino acids and discuss related	Medical Biochemistry	Protein digestion and absorption, reabsorption, and related disorders
02	Clearly differentiate between protein digestion and	Medical	Protein

	<p>degradation.</p> <p>Compare the salient feature of the two major mechanisms for degradation of body proteins.</p>	Biochemistry	Metabolism/ Protein degradation and turnover
03	<p>Define amino acid pool. Delineate the sources and fates of amino acids.</p> <p>Give definition of nitrogen balance and its three states. Give physiological and/or pathological conditions associated with each state of nitrogen</p>	Medical Biochemistry	Protein Metabolism/ Amino acid pool and nitrogen balance
04	<p>Enlist 7 important reactions involved in amino acid metabolism and give a brief introduction of each. (Deamination, Transamination, Trans-deamination, Deamidation, Decarboxylation, Transmethylation & Transpeptidation)</p>	Medical Biochemistry	Protein Metabolism/ Introduction to Reactions involved in catabolism
05	<p>Define transamination. Describe the reactions catalyzed by ALT (alanine transaminase) and AST (aspartate aminotransferase) with special reference to the role of pyridoxal phosphate in the transfer of amino group.</p> <p>Give diagnostic and prognostic importance of serum ALT and AST.</p>	Medical Biochemistry	Protein Metabolism/ Transamination
06	<p>Define oxidative deamination. Describe the reaction catalyzed by glutamate dehydrogenase (GDH) along with its significance.</p>	Medical Biochemistry	Protein Metabolism/ Trans deamination

07	<p>Define deamidation.</p> <p>Describe deamidation reaction catalyzed by glutaminase and asparaginase along with their significance.</p> <p>Explain how does L-asparaginase help in the management of certain types of leukemia.</p>	<p>Medical Biochemistry</p>	<p>Protein Metabolism/ Deamidation</p>
08	<p>Define decarboxylation. Describe important decarboxylation reactions along with their significance</p>	<p>Medical Biochemistry</p>	<p>Protein Metabolism/ Decarboxylation</p>
09	<p>Give sources of ammonia in human body.</p> <p>Describe how ammonia is transported to liver with special reference to the role of glutamine</p>	<p>Medical Biochemistry</p>	<p>Protein Metabolism/ Sources and transport of ammonia</p>
10	<p>Elaborate the reactions and regulation of urea cycle.</p> <p>Enlist the inherited and acquired causes of hyperammonemia in each condition.</p> <p>Give the biochemical mechanisms underlying ammonia intoxication.</p>	<p>Medical Biochemistry</p>	<p>Protein Metabolism/ Urea cycle, ammonia intoxication and its management</p>
11	<p>Trace the pathways for synthesis of non-essential amino acids (NEAA) (alanine, aspartate, glutamate,</p>	<p>Medical Biochemistry</p>	<p>Protein Metabolism/ Biosynthesis of</p>

	glutamine, asparagine, proline, serine, glycine, cysteine, and tyrosine)		NEAA
12	<p>Discuss the fate of carbon skeletons of amino acids.</p> <p>Categorize amino acids into glucogenic, ketogenic or both depending upon the intermediates produced during their catabolism.</p> <p>Outline the catabolic pathways of amino acids that yield oxaloacetate.</p> <p>Outline the catabolic pathways of amino acids that yield α-ketoglutarate.</p> <p>Outline the catabolic pathways of amino acids that yield pyruvate.</p> <p>Outline the catabolic pathways of amino acids that yield fumarate.</p>	Medical Biochemistry	Protein Metabolism/ Degradation of carbon skeleton of amino acids
13	<p>Describe the metabolism of methionine.</p> <p>Discuss cause, Key diagnostics features and</p> <p>Describe the catabolism of branched chain amino acids.</p> <p>Discuss cause, key diagnostic features, and</p>	<p>Biochemistry/ integrate with Pediatrics</p> <p>Biochemistry/ integrate with Pediatrics</p>	Protein Metabolism/ Inborn errors of amino acid metabolism

	(MSUD).		
	Describe the metabolism of tyrosine.		
	Discuss the cause, key diagnostic features, and management of galactosemia, albinism, and maple syrup urine disease.	Biochemistry/ Integrate with Pediatrics	
	Give cause, key diagnostic features, and management of phenylketonuria (PKU)	Biochemistry/ Integrate with Pediatrics	
	Elaborate special roles of glycine, tryptophan, phenylalanine, tyrosine, and methionine		
14	Describe ionization of water and elaborate its significance. Discuss water and electrolyte balance in health and disease.	Biochemistry	Water, pH, Buffers/ Ionization of water
15	Define pH and describe the concept of pH scale.		Water, pH, Buffers/ Henderson-Hasselbach
16	Define weak acids and conjugate base.		Water, pH, Buffers/ weak acids and their significance
17	Define K_a and pK_a and give their significance.		Water, pH, Buffers/ K_a and pK_a
18	Describe Henderson-Hasselbach (HH) equation. (no derivation required) along with its application/use.		Water, pH, Buffers/ HH equation and its applications
19	Define buffers. Enumerate the component of a buffers system and describe their mechanism of action. Enlist important buffers present in blood, plasma, ECF (Extra Cellular Fluid), ICF (Intra Cellular Fluid) and renal tubular fluid. Elaborate the working of bicarbonate buffer and phosphate buffer.	Biochemistry	Water, pH, Buffers/ HH equation and its applications

20	Elaborate the role of kidneys in the regulation of acid base balance.		Acid Base balance and imbalance/ Renal mechanisms for pH regulation
21	Elaborate the concept of 1 st , 2 nd and 3 rd line of defense against changes in H ⁺ ion concentration.	Biochemistry	Acid Base balance and imbalance/ Defense mechanisms against changes in H ⁺ concentration
22	Define acidosis and alkalosis. Classify acid base disorders. Enlist causes of metabolic acidosis and give its compensation. Enlist causes of respiratory acidosis and give its compensation. Enlist causes of metabolic alkalosis and give its compensation.	Biochemistry/ Integrate with Medicine	Acid Base balance imbalance/ Types of acid base disorders
23	Interpret disorders metabolic and respiratory disorders of acid base balance on basis of sign, symptoms and arterial blood gas (ABG) findings Give biochemical explanation for tetany associated	Biochemistry	Acid Base balance imbalance/ Tetany in alkalosis

PRACTICAL

Sr.no	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 02+10=12	
		DISCIPLINE	TOPIC
26	Perform a complete examination of the urine sample URS-10 (using urine reagent-10) and interpret its report	Physiology Practical	Interpretation of report
	Determine the specific gravity of urine		
24	Estimate blood urea level and interpret your results.	Biochemistry Practical	Interpretation of results
	Estimate serum creatinine level and interpret your results. Compare the usefulness of blood urea and serum creatinine in assessment of renal functions.		
	Determination of proteins in urine by dipstick method and interpret your results.		
	Estimate serum acid phosphatase level and interpret your results.		
PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS			
Sr.no	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 13	
		DISCIPLINE	TOPIC
01	Classify diuretics & carbonic anhydrase inhibitor. MOA, clinical uses, and adverse effects	Pharmacology & Therapeutics	Diuretics
	Describe Thiazide & loop diuretics their Mechanism of Action, clinical uses, and adverse effects.		
	Describe Potassium sparing and osmotic diuretics their mechanism of action, clinical uses, and adverse effects.		
01	Discuss the etiology and pathogenesis of different types of stones.	Pathology	Renal Stones

02	Identify the causes, morphological aspect &		Hydronephrosis
03	Enlist common causative agents of urinary tract infections and describe pathogenesis and clinical features of common causative agents of UTI.		UTI causative agents
04	Define various presentations of glomerulonephritis. Define nephrotic and nephritic syndrome. List various risk factors and outline management of glomerulonephritis.		Glomerulonephritis
05	Define AKI (acute kidney injury) Identify various risk factors and causes for AKI. Outline management strategies.		Acute Kidney Injury
06	Define UTI (Urinary Tract Infection)	Integrate with Medicine	Urinary tract infection
	Identify various risk factors and causes of UTI.		
	Describe signs and symptoms of UTI.		
	Outline management strategies.		
DISEASE PREVENTION AND IMPACT			
Sr.no	SPECIFIC LEARNING OBJECTIVES	TOTAL HOURS = 04	
		DISCIPLINE	TOPIC
01	Discuss the significance of quality of life in disease and treatment settings. Measures of health status. Disability-Adjusted Life Year (DALY) and Quality-Adjusted Life Year (QALY) Life expectancy.	Community Medicine and	Quality of life
01	To identify the behavioral abnormalities caused by renal function.	Behavioral Sciences	Dementia, uremic encephalopathy, delusion, muscle paralysis & Societal
	To identify the cognitive abnormality.		
	To identify the dangers for the patient, his family, and society.		

AGING			
Sr.no	THEORY	TOTAL HOURS = 02	
	SPECIFIC LEARNING OBJECTIVES	DISCIPLINE	TOPIC
01	To define preventive care in diseases related to urinary system(adults). <u>Primary, secondary, and tertiary prevention.</u>	Community	Disease prevention
02	Define urinary incontinence. Outline management strategies.	Medicine	Urinary incontinence