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| GIT-A-025 | Identify, draw and label the histological structure of small intestine (Duodenum, Jejunum, and Ileum) and enumerate points of identification | Histology Practical | Small Intestine |
| GIT-A-026 | Identify, draw and label the histological structure of large intestine and enumerate points of identification | Histology Practical | Large Intestine |
| GIT-A-027 | 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 |
| GIT-A-028 | 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

| CODE | MEDICAL PHYSIOLOGY | TOTAL HOURS = 20 | |
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| | SPECIFIC LEARNING OBJECTIVES | DISCIPLINE | TOPIC |
| GIT-P-001 | 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 membrane | | |
| | 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 | | |

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| | 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 GIT blood flow | | |
| | Explain the nervous control of GIT blood flow | | |
| GIT-P-002 | 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 | |
| GIT-P-003 | 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 | |

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| | 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 | Medical Physiology integrates with Medicine | |
| | Enumerate the causes, features, and pathophysiology of peptic ulcer | | |
| | Explain the physiological basis of each feature of peptic ulcer | | |
| GIT-P-004 | Enumerate and explain the hormones and movements of small intestine | Medical Physiology | Small Intestine |
| | Explain the term “peristaltic rush” | | |
| | Explain the functions of ileocecal valve and sphincter | | |
| | Enumerate the types of intestinal sprue | Medical Physiology integrates with Medicine | |
| | Enlist the features of intestinal sprue | | |
| | Explain the consequences of sprue on the body | | |
| GIT-P-005 | Enumerate the types of movements taking place in colon | Medical Physiology | Large Intestine |
| | Explain the mechanism of developing movements of colon and their control through Gastrocolic and Duodenocolic Reflexes | Medical Physiology | |
| | Enlist the defecation reflexes | Medical Physiology | |
| | Explain the mechanism of defecation reflex | Medical Physiology | |
| | Trace the reflex arc of defecation | Medical | |

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| | | Physiology | |
| | Name the other autonomic reflexes that affect bowel activity | Medical Physiology | |
| | Explain the pathophysiology of constipation | Medical Physiology integrates with Medicine | |
| | Discuss the causes of diarrhea<br><br>Describe the cause of Hirschsprung's disease integrate with Medicine | Medical Physiology | |
| GIT-P-006 | 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 | |
| GIT-P-007 | 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 | |
| GIT-P-008. | 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 | |
| GIT-P-009 | Define Malnutrition | Integrated with Medicine Gastroenterology | Malnutrition |
| | Identify various causes of malnutrition | | |
| | Identify the risk factors of malnutrition | | |
| | Outline treatment strategies | | |
| GIT-P-010 | Define Acute Diarrhea | | Acute & Chronic Diarrhea |
| | Define Chronic Diarrhea | | |

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| | 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. | | |
| GIT-B-026 | Interpret the results of Lactose tolerance test. | | Interpretation of results |
| GIT-B-027 | Determine BMI of given subject and interpret the results. | | Determination & interpretation of results |
| GIT-P-011 | Demonstrate Cranial nerve V, IX & X testing | Physiology | Cranial nerve |
| **AGING** | | | |
| **CODE** | **THEORY** | **TOTAL HOURS = 01** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| GIT-CM-001 | Identify causes and risk factors for malnutrition in elderly<br>Outline treatment strategies | Community Medicine | Preventive Medicine in Geriatrics |
| **PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS** | | | |
| **CODE** | **SPECIFIC LEARNING OBJECTIVES** | **TOTAL HOURS = 03** | |
| | | **DISCIPLINE** | **TOPIC** |
| GIT-Ph-001 | Classify anti diarrheal drugs and describe the pharmacokinetics, mechanism of action, pharmacological effects, uses and adverse effects | Pharmacology | Anti Diarrheal Drugs |
| GIT-Pa-001 | Describe the etiology, pathogenesis, morphology and clinical features of peptic ulcer disease | Pathology | Peptic Ulcer |
| GIT-Pa-002 | Enumerate common infectious agents of diarrheal diseases<br>Discuss pathogenesis and clinical features of common pathogens | Pathology | Infectious agents causing Diarrhea |

| PRACTICAL | | | |
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| CODE | HISTOLOGY | TOTAL HOURS = 06 | |
| | SPECIFIC LEARNING OBJECTIVES | DISCIPLINE | TOPIC |
| R-A-013 | Identify and draw and label the histological structure of kidney and enumerate points of identification | Practical | Kidney |
| R-A-014 | Identify, draw and label the histological structure of ureter and enumerate its points of identification | Practical | Ureter |
| R-A-015 | Identify, draw and label the histological structure of urinary bladder and enumerate its points of identification | Practical | Urinary bladder |
| **NORMAL FUNCTION** | | | |
| **THEORY** | | | |
| CODE | MEDICAL PHYSIOLOGY | TOTAL HOURS = 36 | |
| | SPECIFIC LEARNING OBJECTIVES | DISCIPLINE | TOPIC |
| R-P-001 | 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 | | |
| R-P-002 | Enumerate causes of Intracellular and extracellular edema | Integrate with Medicine | Edema |
| | Describe safety factors that prevent edema | | |
| R-P-003 | Explain the functions of the kidney | Physiology | Function |
| R-P-004 | Describe the mechanism of micturition and its control | | Micturition reflex |

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| | Explain the role of higher center on micturition | | |
| | Explain the physiological anatomy and innervation of bladder | | |
| | Discuss the voluntary control of micturition | | |
| R-P-005 | Explain the causes, pathophysiology, and features of atonic bladder.<br>Discuss the causes, pathophysiology, and features of automatic bladder.<br>Write the causes, pathophysiology, and features of uninhibited neurogenic bladder | Integrate with Pathology | Abnormalities of micturition |
| R-P-006 | Enlist the steps of urine formation | Physiology | Urine formation |
| | Explain the physiological anatomy and functions of glomerular capillary membrane | | |
| | Discuss the composition of filtrate | | |
| | Explain the minimal change nephropathy and increase permeability to plasma protein | | |
| R-P-007 | Define Glomerular Filtration Rate (GFR). | Physiology | Glomerular filtration |
| | Describe the determinants of GFR | | |
| | Explain the factors affecting GFR | | |
| | Discuss the hormones and autocoids that affect GFR | | |
| | Explain mechanisms of autoregulation of GFR | | |
| | Enlist the physiological and pathological factors that decrease GFR | | |
| | Explain the effects of angiotensin II blocker on GFR during renal hypoperfusion | | |
| R-P-008 | Enumerate different types of transport along the kidney tubules for reabsorption | Physiology | Reabsorption |
| | Explain the reabsorption and secretion along different parts of the Nephron | | |
| | Explain the regulation of tubular reabsorption | | |
| | Discuss the forces / pressure and hormones that | | |

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| | 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 | | |
| R-P-009 | Explain the use of clearance method to quantify kidney function | Physiology | Clearance method |
| R-P-010 | Describe mechanism of re-absorption of sodium along different parts nephrons | Physiology | Transport maximum |
| | Define and explain the term Transport maximum for the substances | | |
| | Define filtered load for the substance | | |
| | Justify the difference of transport maximum and renal threshold of glucose in renal tubules | | |
| R-P-011 | Explain the renal mechanisms for excreting Dilute urine | Physiology | Urine concentration and dilution |
| | Explain the mechanism for forming a concentrated urine | | |
| | Discuss the role of urea in the process of counter current multiplier mechanism | | |
| | Describe the countercurrent exchange in vasa Recta to preserve hyperosmolarity of renal medulla | | |
| R-P-012 | Define and explain the term obligatory urine volume.<br>Define and explain free water clearance.<br>Define Urine specific gravity. | Physiology | Obligatory urine volume |
| R-P-013 | Enumerate different abnormalities of urinary concentrating ability | Physiology | Disorders of urine concentrating ability |
| R-P-014 | Enumerate the types of Diabetes insipidus | Integrate with | Diabetes |

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| | Enlist the features of diabetes insipidus | Medicine | insipidus |
| | Explain the pathophysiology and treatment of central diabetes insipidus | | |
| | Discuss the pathophysiology of nephrogenic diabetes insipidus | | |
| R-P-015 | 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 | | |
| R-P-016 | Explain the mechanism of thirst | | Thirst |
| R-P-017 | 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<br>Explain the regulation of internal potassium distribution and potassium secretion | | |
| R-P-018 | Explain the control of extracellular fluid osmolarity and sodium concentration | | Control of ECF osmolarity |
| R-P-019 | 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 | | |
| R-P-020 | Explain the renal handling of calcium concentration to regulate plasma calcium concentration | | Renal regulation of calcium<br>Renal regulation of phosphate |
| | Enumerate the factors that alter renal calcium | | |
| | Enlist the factors that alter renal phosphate excretion | | |

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| R-P-021 | Explain the nervous and hormonal factors that increase the effectiveness of renal body fluid feedback control | Physiology | Renal body fluid feedback control |
| R-P-022 | Explain the conditions that cause large increase in blood volume and ECF volume<br>Explain the conditions that cause large increase ECF volume but with normal blood volume | | ECF and blood volume |
| R-P-023 | Explain the renal handling of $H^+$ ion. | | Acid base balance |
| R-P-024 | Analyze the acid base disturbances on the basis of pH, HCO3 and CO2 | 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 | | |
| R-P-025 | Define and explain anion gap | Physiology | Anion gap |
| **CODE** | **MEDICAL BIOCHEMISTRY** | **TOTAL HOURS = 23** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| R-B-001 | Describe digestion and absorption of dietary proteins along with the inherited and acquired disorders (peptic ulcer, Hartnup disease, gluten enteropathy and cystic fibrosis).<br>Elaborate the mechanisms involved in renal reabsorption of amino acids and discuss related disorders (Hartnup disease and cystinuria) | Medical Biochemistry | Protein digestion and absorption, reabsorption, and related disorders |
| R-B-002 | Clearly differentiate between protein digestion and | Medical | Protein |

| PRACTICAL | | | |
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| **CODE** | **SPECIFIC LEARNING OBJECTIVES** | **TOTAL HOURS = 02+10=12** | |
| | | **DISCIPLINE** | **TOPIC** |
| R-P-026 | 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 | | |
| R-B-024 | 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** | | | |
| **CODE** | **SPECIFIC LEARNING OBJECTIVES** | **TOTAL HOURS = 13** | |
| | | **DISCIPLINE** | **TOPIC** |
| R-Ph-001 | 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. | | |
| R-Pa-001 | Discuss the etiology and pathogenesis of different types of stones. | Pathology | Renal Stones |

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| | Explain the mechanism of intracellular signaling after hormone receptor activation.<br>Name the hormones that use enzyme-linked hormone receptors signaling.<br>Explain the mechanism of enzyme linked receptors.<br>Enlist second messenger mechanisms for mediating intracellular hormonal functions.<br>Define second messenger system.<br>Explain the adenylyl cyclase– cAMP Second Messenger System.<br>Enumerate the hormones that use the adenylyl cyclase–cAMP Second Messenger System.<br>Explain The cell membrane phospholipid second messenger System.<br>Enumerate the hormones that use cell membrane phospholipid second messenger system.<br>Explain the mechanism of calcium Calmodulin system. | | |
| EnR-P-001 | Name the hormones/ factors of hypothalamus.<br>Name the hormones of anterior pituitary.<br>Name the hormones of posterior pituitary.<br>Describe the functional relationship between hypothalamus, anterior and posterior pituitary gland.<br>Explain the significance of hypothalamic- hypophysial portal circulation.<br>Explain the hypothalamic pituitary tract.<br>Explain the mechanism of action of growth hormone.<br>Explain the actions of Growth hormone on Carbohydrate.<br>Discuss the actions of Growth hormone on protein metabolism.<br>Describe the actions of Growth hormone on fat metabolism. | Physiology | Hypothalamus / Pituitary Gland |

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| | Explain the effect of growth hormone on skeletal growth and age.<br>Explain the significance of somatomedins in mediating the actions of growth hormone.<br>Describe the regulation of Growth Hormone.<br>Describe the causes and features and treatment of panhypopituitarism in adults and childhood.<br>Define Sheehan's syndrome.<br>Enlist the types of dwarfism according to cause.<br>Explain the pathophysiology and features of gigantism and acromegaly.<br>Explain the mechanism of action of antidiuretic hormone.<br>Discuss the actions of antidiuretic hormone.<br>Regulation of antidiuretic hormone production.<br>Elaborate the mechanism of action of oxytocin.<br>Discuss the actions of oxytocin. | | |
| EnR-P-002 | Discuss the transport of thyroid hormone<br>Discuss the mechanism of action of thyroid hormone<br>Explain the actions of thyroid hormone on carbohydrate metabolism<br>Discuss the actions of thyroid hormone on protein metabolism<br>Explain the actions of thyroid hormones on fat metabolism<br>Explain the non-metabolic functions of thyroid hormone<br>Explain the regulation of thyroid hormone<br>Enumerate antithyroid substances and explain their mechanism of action<br>Enumerate the causes of hyperthyroidism | Physiology | Thyroid gland |
| | Explain the features, pathophysiology and treatment of thyrotoxicosis/ grave's disease<br>Explain the thyroid function test to investigate hypo and | | |

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| | hyperthyroidism<br>Enlist the causes of hypothyroidism<br>Explain the pathophysiology of Hashimoto hypothyroidism<br>Discuss the features and pathophysiology and treatment of myxedema<br>Explain the pathophysiology and features of endemic colloid goiter<br>Discuss the pathophysiology and features of nontoxic colloid goiter<br>Enlist the causes of cretinism<br>Discuss the features and pathophysiology of cretinism | | |
| EnR-P-003 | Name the hormones of adrenal cortex.<br>Explain the physiological anatomy of adrenal cortex.<br>Explain the cellular mechanism of Aldosterone action.<br>Explain the effects of mineralocorticoid hormone.<br>Discuss the regulation of aldosterone secretion.<br>Discuss the metabolic and non-metabolic functions of cortisol<br>Explain the interconversion of active cortisol and inactive cortisone by the 2, 11 beta hydroxysteroid dehydrogenase isoform.<br>Explain the mechanism for regulation of glucocorticoid secretion by hypothalamus and pituitary<br>Name adrenal androgens and enlist the functions of adrenal androgens.<br>Discuss the causes, features, pathophysiology and treatment of hypoadrenalism (Addison's disease).<br>Enlist the causes of hyperadrenalism.<br>Explain the features, pathophysiology and treatment of Cushing's syndrome.<br>Differentiate between Cushing's syndrome and Cushing's disease | Physiology & Pathology | Adreno cortical hormones |

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| | Explain the clinical importance of dexamethasone suppression test to diagnose Cushing's syndrome.<br>Discuss the features, pathophysiology and treatment of Conn's syndrome.<br>Enlist the cause, features and pathophysiology of congenital adrenal hyperplasia/ Androgenital syndrome. | | |
| EnR-P-004 | Enumerate the types of pancreatic cells with their hormones.<br>Explain the mechanism of action of insulin.<br>Discuss the synthesis and mechanism of release of insulin.<br>Explain the effects of insulin on carbohydrate, protein and lipid metabolism.<br>Enlist the actions of insulin on liver, adipose tissue and skeletal muscle.<br>Enlist the factors and conditions that increase or decrease insulin secretion. | Physiology | Pancreatic hormones |
| | Explain the role of insulin (and other hormones) in "switching" between carbohydrate and lipid metabolism.<br>Discuss the effects of glucagon on carbohydrate and lipid metabolism.<br>Explain the factors that regulate the secretion of glucagon.<br>Explain the 24-hour regulation of glucose.<br>Discuss the importance of blood glucose regulation.<br>Explain the actions of somatostatin. | | |
| EnR-P-005 | Enlist the types of diabetes mellitus<br>Explain the causes of Type I and type II diabetes mellitus<br>Discuss the features and pathophysiology of diabetes mellitus<br>Explain the role of insulin resistance, obesity and metabolic syndrome in developing type II diabetes | Physiology | Abnormalities of Glucose regulation |

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| | mellitus<br>Explain how to diagnose the diabetes mellitus<br>Explain the treatment of type I and type II diabetes mellitus Explain the features, cause of insulinoma | | |
| EnR-P-006 | Discuss the physiological anatomy of parathyroid gland<br>Explain the rapid and slow mechanism of resorption of bone by parathyroid hormone<br>Discuss the actions of parathyroid<br>Explain the control of parathyroid secretion by calcium ion concentration | Physiology | Parathyroid hormones |
| EnR-P-007 | Discuss the effects of Vitamin D<br>Discuss the effects of calcitonin on calcium<br>Discuss the regulation of calcium (the first & second line of defense)<br>Explain the causes and features of hypoparathyroidism<br>Explain the causes and the features of primary and secondary hyperparathyroidism<br>Enumerate the causes and features of osteoporosis | Physiology | Regulation of calcium in body |
| EnR-P-008 | Enlist the functions of adrenal medullary hormones and explain pheochromocytoma | Physiology | Adreno medullary hormones |
| EnR-P-009 | Describe the hormonal factors that affect spermatogenesis<br>Explain the maturation and storage of sperm in epididymis<br>Discuss the structure and physiology of a mature sperm<br>Describe the composition of semen<br>Discuss the functions of prostate & seminal vesicles in the formation of semen<br>Explain the phenomenon of capacitation and its significance<br>Describe the acrosome Reaction and its significance<br>Discuss the role of pineal gland in reproduction | Physiology | Spermatogenesis<br>Capacitation & Acrosome reaction |
| EnR-P-010 | Discuss the site of secretion of testosterone | Physiology | Testosterone |

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| | Name the active form of testosterone<br>Explain the production of estrogen in males<br>Describe the basic intracellular mechanism of action of testosterone | | |
| | Explain the functions of testosterone in intrauterine life and after birth<br>Discuss the regulation of male sexual functions by hormones from the hypothalamus and anterior pituitary gland | | |
| EnR-P-011 | Enumerate and explain the phases of ovarian cycle along with the hormonal changes<br>Explain the postulated mechanism of ovulation<br>Explain the formation and involution of Corpus luteum<br>Endometrial cycle<br>Explain the structural and hormonal changes of endometrial cycle<br>Explain the regulation of female monthly cycle<br>Discuss the role of progesterone on female sexual organs | Physiology | Menstrual cycle |
| EnR-P-012 | Enumerate the ovarian hormones<br>Discuss the synthesis of estrogen and progesterone<br>Describe the interaction of follicular theca and granulosa cells for production of estrogens with the help of a diagram<br>Explain the functions of the estrogens on different organs Discuss the role of progesterone on female sexual organs | Physiology | Female sexual hormones |
| EnR-P-013 | Explain the physiological basis of puberty, menarche<br>Define menopause<br>Explain the cause of menopause<br>Discuss the physiological changes in the function of the body at the time of menopause | Physiology | Puberty, menarche & menopause |
| EnR-P-014 | Explain the non-hormonal functions of placenta | Physiology | Normal Pregnancy |

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| | Explain the hormonal factors in pregnancy/ hormones of placenta<br>Explain the changes in non- placental hormones during pregnancy<br>Response of the mother's body to pregnancy<br>Explain the mechanical and hormonal factors that increase uterine contractility during parturition | | |
| EnR-P-015 | Explain the physiology of lactation<br>Discuss the actions of prolactin<br>Justify the suppression of ejection of milk during pregnancy Discuss the physiological basis of suppression of the female ovarian cycles in nursing mothers for many months after delivery | Physiology | Lactation |
| **CODE** | **MEDICAL BIOCHEMISTRY** | **TOTAL HOURS = 35** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| EnR-B-001 | Define different chemical messengers.<br>Enlist endocrine organs and hormones of the body.<br>Enlist the hormones on the basis of chemical nature.<br>Discuss the feedback control of hormone secretion.<br>Explain the up and down regulation of receptors.<br>Enlist the location of hormone receptors.<br>Explain the mechanism of intracellular signaling after hormone receptor activation.<br>Name the hormones that use enzyme-linked hormone receptors signaling.<br>Explain the mechanism of enzyme linked receptors.<br>Explain the mechanism of hormones that receptors present in cytoplasm and nucleus (act on genetic machinery).<br>Enlist second messenger mechanisms for mediating intracellular hormonal functions. | Biochemistry | Introduction to Endocrinology |

# PRACTICAL

| CODE | BIOCHEMISTRY | TOTAL HOURS = 06+02=08 | |
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| | SPECIFIC LEARNING OBJECTIVES | DISCIPLINE | TOPIC |
| EnR-B-022 | Perform DNA extraction | Biochemistry | DNA |
| EnR-B-023 | Perform Electrophoresis | Biochemistry | Electrophoresis |
| EnR-B-0234 | Perform PCR | Biochemistry | PCR |
| EnR-B-025 | Demonstrate ELISA (enzyme-linked immunoassay) to measure concentration of hormones | Biochemistry | ELISA |
| EnR-P-016 | Perform Pregnancy test | Physiology | Pregnancy test |

## PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 02 | |
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| | | DISCIPLINE | TOPIC |
| EnR-Ph-001 | Explain the mechanism of action of thyroxine<br>Explain Clinical uses and potential adverse effects with use of Thyroxine | Pharmacology | Anti thyroid substance & MOA, uses, effects |

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 09 | |
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| | | DISCIPLINE | TOPIC |
| EnR-Pa-001 | Enumerate clinical manifestations along with hormone levels of anterior pituitary<br>Classification of pituitary adenomas | Pathology | Pathology of Anterior Pituitary Gland |
| EnR-Pa-002 | Enumerate and describe posterior pituitary syndromes (inappropriate ADH (Anti Diuretic Hormone) secretion, diabetes insipidus) | Pathology | Pathology of Posterior Pituitary Gland |
| EnR-Pa-003 | Enumerate causes of hypo and hyperthyroidism along with levels of thyroid hormones | Pathology | Pathology of Thyroid Gland |
| EnR-Pa-004 | Enumerate causes of hypercalcemia, hyper and hypoparathyroidism | Pathology | Pathology of Parathyroid Gland |

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| HNSS-A-052 | Draw and label a diagram to show histological structure of thyroid and parathyroid gland. | Histology | Thyroid, Parathyroid |
| HNSS-A-053 | Draw and label diagrams to show histological structure of eyelid and cornea. | Histology | Eye |
| | Draw and label a diagram to show histological structure of retina. List its histological layers and their respective components | Histology | |
| HNSS-A-054 | Draw and label a diagram to show histological structure of internal ear. | Histology | Ear |
| **NORMAL FUNCTION** | | | |
| **THEORY** | | | |
| **CODE** | **MEDICAL PHYSIOLOGY** | **TOTAL HOURS = 30** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| HNSS-P-001 | Define and describe the visual acuity | Physiology | Visual Acquity |
| | Define Emmetropia | Physiology | |
| | Enlist the errors of refraction | Physiology | |
| | Explain the cause, features, physiological basis, and correction of Hyperopia | Physiology | |
| | Explain the cause, features, physiological basis, and correction of myopia | Physiology | |
| | Explain the cause, features, physiological basis, and correction of astigmatism | Physiology | |
| | Describe the pathophysiology and treatment of cataract | Integrate with Ophthalmology | |
| HNSS-P-002 | Interpret common treatment modalities for Refractive errors | Physiology | Refractive Errors |
| HNSS-P-003 | Describe the mechanism of formation and outflow of aqueous humor | Physiology | Fluid systems of the Eye |
| | Describe normal value of intraocular pressure and its regulation | Physiology | |

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| | Describe the method for measuring the intraocular pressure | Integrate with Ophthalmology | |
| | Describe the causes and features and pathophysiology of glaucoma | Physiology | |
| HNSS-P-004 | Discuss the clinical features of Open Angle and Angle Closure Glaucoma | Physiology | Glaucoma |
| HNSS-P-005 | Describe the physiological anatomy and function of structural elements of retina | Physiology | Retina |
| | Enlist different layers of retina | Physiology | |
| | Explain the significance of melanin pigment in retina | Physiology | |
| | Describe macula and foveal region of retina and their significance | Physiology | |
| | Describe the structure of rods and cones | Physiology | |
| | Comment on the location of optic disc and its significance | Physiology | |
| | Describe the cause, features, and treatment of retinal detachment | Physiology | |
| | Enlist the current investigations for Retinal Diseases | Integrate with Ophthalmology | |
| HNSS-P-006 | Describe the rhodopsin-retinal visual cycle | Physiology | Photochemistry of vision |
| | Describe the mechanism of excitation of rods/ rods receptor potential | Physiology | |
| | Describe the causes and treatment of night blindness | Physiology | |
| HNSS-P-007 | Define and describe different mechanisms of light adaptation | Physiology | Adaptation |
| | Define and describe different mechanisms of dark adaptation | Physiology | |
| | Enumerate the diseases leading to Night Blindness and retinal detachment | Integrate with Ophthalmology | |
| HNSS-P- | Explain the tri color mechanism of color | Physiology | Color vision |

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| 008 | determination | | |
| | Define term protanopes, deuteranopes, tritanopes | Physiology | |
| | Enlist the types of color blindness and their causes | Physiology | |
| | Enlist clinical features of Color vision deficiencies | Integrate with Ophthalmology | |
| HNSS-P-009 | Trace the visual pathway | Physiology | Visual Pathways |
| | Enlist and describe the abnormalities of visual pathway & visual field | | |
| | Explain the effect of removal of primary visual cortex | | |
| HNSS-P-010 | Define the physiological blind spot and describe its location | Physiology | Field of vision |
| | Define scotoma/ pathological blind spot and enlist causes | Physiology | |
| HNSS-P-011 | Illustrate the abnormalities of field of vision | Integrate with Ophthalmology | Visual fields |
| HNSS-P-012 | Describe the muscular and neural control of eye movements | Physiology | Eye movements |
| HNSS-P-013 | Define and enlist the types of Strabismus | Integrate with Ophthalmology | Strabismus |
| HNSS-P-014 | Explain the mechanism of accommodation | Physiology | Accommodation |
| | Enlist the components of near response in accommodation | Physiology | |
| | Describe the neural pathway for accommodation reflex | Physiology | |
| | Describe the regulation of accommodation | Physiology | |
| | Enlist the clinical features of Presbyopia | Integrate with Ophthalmology | |
| HNSS-P-015 | Trace the neural pathway for pupillary light reflex | Physiology | Pupillary light reflex |
| | Explain the pupillary light reflexes or reactions in CNS diseases | Physiology | |
| | Describe the cause and features of Horner syndrome | Physiology | |
| | Illustrate the differential diagnosis of Anisocoria | Integrate with | |

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| | | Ophthalmology | |
| HNSS-P-016 | Describe the physiological anatomy of outer and middle ear | Physiology | Sense of hearing |
| | Enlist the functions of middle ear | Physiology | |
| | Discuss clinical features and treatment of impacted wax | Integrate Otorhinolaryngology | |
| | Define causes and clinical features of Otomycosis | Integrate Otorhinolaryngology | |
| | Describe the mechanism of impedance matching and its significance | Physiology | |
| | Describe the mechanism of attenuation reflex and its significance | Physiology | |
| HNSS-P-017 | Describe the physiological anatomy of inner ear | Physiology | Inner Ear/ Cochlea |
| | Describe the mechanism of transmission of sound waves in cochlea | Physiology | |
| HNSS-P-018 | Describe the physiological anatomy and function of organ of Corti | Physiology | Organ of Corti |
| | Describe the mechanism of generation of endo-cochlear potential and its significance | Physiology | |
| HNSS-P-019 | Write down the normal range of frequency for hearing | Physiology | Determination of sound frequency |
| | Describe the role of place principle in determination of sound frequency | Physiology | |
| | Describe the role of volleys principle in determination of sound frequency | Physiology | |
| HNSS-P-020 | Trace the normal auditory nervous pathway | Physiology | Auditory pathway |
| | Describe the types of deafness | Physiology | |
| | Discuss the clinical features and investigations of Congenital and Acquired hearing loss | Integrate with Otorhinolaryngology | |
| HNSS-P-021 | Enlist the primary taste sensations | Physiology | Sense of Taste |
| | Define and explain the term taste blindness | Physiology | |

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| | Describe the physiological anatomy and location of taste buds | Physiology | |
| HNSS-P-022 | Describe the mechanism of stimulation of taste buds/ receptor potential | Physiology | Excitation of Taste buds |
| | Trace the pathway of taste sensation | Physiology | |
| HNSS-P-023 | Define and explain the terms: Ageusia, Hypergeusia, Hypogeusia and dysgeusia | Physiology | Abnormalities of Taste sensations |
| | Describe the senile changes in taste buds | | |
| HNSS-P-024 | Explain the terms: Taste preference and taste aversion | Physiology | Taste preference and aversion |
| HNSS-P-025 | Enlist the primary sensations of smell | Physiology | Sense of smell |
| | Describe the physiological anatomy and location of olfactory membrane | Physiology | |
| HNSS-P-026 | Enlist the causes and clinical features of Rhinitis | Integrate with Otorhinolaryngology | Rhinitis |
| | Differentiate between viral and allergic Rhinitis | Integrate with Otorhinolaryngology | |
| **CODE** | **MEDICAL BIOCHEMISTRY** | **TOTAL HOURS = 7** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| HNSS-B-001 | Discuss the metabolism of mono and disaccharides | Biochemistry | Metabolism of mono and disaccharides |
| | Interpret Hereditary fructose intolerance, fructosuria, galactosemia and lactose intolerance, in relevance to the clinical findings | Biochemistry | |
| | Explain the Polyol pathway and effect of hyperglycemia on sorbitol pathway | Biochemistry | |
| | Discuss the sources, metabolically active forms, biochemical role and clinical correlation of Vit-A with vision | Biochemistry | |
| HNSS-B-002 | Discuss biochemical basis and clinical aspects of Riboflavin | Biochemistry | Vitamins |

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| HNSS-B-003 | Discuss the sources, absorption, regulation, biomedical functions and clinical aspect of Zn, Fl | Biochemistry | Eye |

## PRACTICAL

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 16+05=21 | |
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| | | DISCIPLINE | TOPIC |
| HNSS-P-027 | Examine the Second, Third, Fourth & Sixth Cranial Nerves | Physiology | Cranial Nerves |
| HNSS-P-028 | Examination of Light Reflex | | Light reflex |
| HNSS-P-029 | Determine the Visual Acuity for Far and Near vision | | vision |
| HNSS-P-030 | Perform Ophthalmoscopy | | ophthalmoscopy |
| HNSS-P-031 | Examine Field of Vision and interpretation of visual field plotted | Physiology | Visual field |
| HNSS-P-032 | Examine Color Vision | | Color vision |
| HNSS-P-033 | Perform Tuning fork test and audiometry, interpret the report | | Ear |
| HNSS-B-004 | Perform estimation of uric acid level in blood | Biochemistry | Uric acid level in blood |
| HNSS-B-005 | Perform HbA1C by chromatographic method | | HbA1C |
| HNSS-B-006 | Detect abnormal constituents in urine by chemical methods | | Abnormal constituents in urine |

## PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 09 | |
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| | | DISCIPLINE | TOPIC |
| HNSS-Pa-001 | Enlist the common causative agents of Eye, Ear infections | Pathology (Microbiology) | Eye/Ear infections |
| | Discuss the pathogenesis and clinical features of common pathogens | Pathology (Microbiology) | |

| NORMAL FUNCTION | | | |
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| **THEORY** | | | |
| **CODE** | **MEDICAL PHYSIOLOGY** | **TOTAL HOURS = 60** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| NS-P-001 | Describe the general organization of nervous system | Medical Physiology | Organization of Nervous System, Neurons and Synapses |
| | Classify synapses | | |
| | Explain physiological anatomy of synapses | | |
| | Describe the properties of synaptic transmission | | |
| | Classify the substances that act as neurotransmitters | | |
| | Classify all sensory receptors in the body | | |
| | Enumerate the properties of receptors | | |
| | Explain the mechanism of adaptation of receptors | | |
| | Enlist the rapid adapting mechanism of receptors | | |
| NS-P-002 | Explain the properties of receptors | | Nerve fibers |
| | Explain the general classification of nerve fibers | | |
| | Explain the numerical classification of nerve fibers | | |
| | Explain Gasser classification of nerve fibers | | |
| | Explain summation and its types | | |
| NS-P-003 | Describe the sensory areas of brain | | Sensory areas of the brain |
| | Enlist Brodmann number of sensory areas | | |
| | Describe the effects produced by damage to each sensory area of brain | | |
| | Describe the pathophysiology and features of personal neglect syndrome | | |
| NS-P-004 | Classify and explain somatic sensations | Medical Physiology | Somatic sensations |
| NS-P-005 | Enumerate the ascending tracts/Pathways | | Ascending Tracts/ pathways |
| NS-P-006 | Name the sensations carried by Dorsal column | Medical | Anterolateral |

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| | medial lemniscus system DCMLS | Physiology | system |
| | Trace the pathway of DCMLS | | |
| NS-P-007 | Classify pain | | Pain |
| | Differentiate between slow pain and fast pain | | |
| | Describe the analgesia system in brain and spinal cord | | |
| | Describe the cause and features of Brown Sequard Syndrome | | |
| NS-P-008 | Describe the Physiological anatomy of spinal cord | Medical Physiology | Spinal cord |
| | Name the anterior motor neurons and their location | | |
| | Explain the Renshaw cells feedback | | |
| | Classify the spinal cord reflexes according to number of synapses | | |
| NS-P-009 | Describe the structure & functions of Muscle spindle | | Muscle Spindle and stretch reflex |
| | Trace the reflex arc of stretch reflex | | |
| | Discuss the clinical significance of stretch reflex | | |
| NS-P-110 | Define tone and how it is maintained | | Tone |
| NS-P-011 | Trace the reflex arc of Golgi Tendon Organ GTO, Golgi tendon reflex<br>Explain the importance of Golgi tendon reflex | | GTO |
| NS-P-012 | Name the motor areas of brain | | Motor areas of the brain |
| | Enlist Brodmann number of motor areas of brain<br>Explain the features produced due to damage to the motor areas | | |
| NS-P-013 | Enlist the functions of brain stem | Medical Physiology | Brainstem |
| NS-P-014 | Enumerate the descending tracts | | Descending tracts |
| | Describe the functions of Pyramidal tract | | |
| | Describe the effect of lesions in motor cortex of brain or pyramidal tract | | |

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| NS-P-015 | Discuss the location of upper and lower motor neuron | | Location of motor neurons |
| | Explain the features of upper motor neuron lesion | | |
| | Explain the features of lower motor neuron lesions | | |
| NS-P-016 | Define spinal shock | Medical Physiology | Spinal shock and hemi section |
| | Enumerate and explain the stages of spinal shock | | |
| | Describe the features of hemi section of spinal cord (at the level, above the level, below the level) | | |
| NS-P-017 | Name the functional parts of cerebellum | | Cerebellum |
| | Explain the functions of spinocerebellum | | |
| | Describe the functions of cerebro cerebellum | | |
| | Discuss the functions of vestibule cerebellum | | |
| | Explain the clinical features of cerebellar disease | | |
| NS-P-018 | Name the components of Basal ganglia | | Basal Ganglia |
| | EXPLAIN the putamen and caudate circuits | | |
| | Enlist the neurotransmitters in basal ganglia and enlist the functions of basal ganglia | | |
| | Enumerate and explain the clinical abnormalities of putamen circuit | | |
| | Explain the pathophysiology and features of Huntington's disease | | |
| | Explain the types of rigidity | | |
| | Differentiate spasticity and rigidity | | |
| | Define decerebrate rigidity | | |
| NS-P-019 | Enumerate the components of vestibular Apparatus | Medical Physiology | Vestibular apparatus |
| | Name the sensory organs of vestibular apparatus | | |
| | Describe the role of vestibular Apparatus in maintenance of linear and angular equilibrium | | |
| NS-P-020 | Enlist the components of limbic system | | Limbic system |
| | Describe the functions of amygdala | | |

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| | Explain the effects of bilateral ablation of the amygdala—The Klüver-Bucy Syndrome | | |
| | Explain the functions of hippocampus | | |
| | Explain the functions of Hypothalamus | | |
| | Explain Functions of Thalamus | | |
| | Discuss the Thalamic syndrome | | |
| NS-P-021 | define brain stem reticular formation (BRF), name the neurotransmitters of BRF, enlist functions of BRF, differentiate between the functions of Pontine and medullary reticular Formation | Medical Physiology | Brain stem reticular formation |
| NS-P-022 | Enumerate and discuss the physiological basis of Electroencephalogram EEG waves | Medical Physiology | EEG |
| NS-P-023 | Explain the types of sleep | | Sleep |
| | Discuss the stages of slow wave sleep | | |
| | Explain the changes in EEG during sleep wake cycle | | |
| | Enumerate the areas and hormones/ neurotransmitters involved in sleep | | |
| | Describe sleep disorders (narcolepsy, cataplexy, insomnia, somnolence, somnambulism, bruxism, nocturnal enuresis and sleep apnea) | | |
| NS-P-024 | Enumerate different types of epilepsy | | Epilepsy |
| | Explain the features and physiological basis and EEG waves in different types of epilepsy | | |
| NS-P-025 | Define memory | | Memory |
| | Classify memory on the basis of duration and information stored | | |
| | Explain the Molecular Mechanism of Intermediate Memory | | |
| | Enumerate the structural changes of long-term memory | | |
| | Explain the higher intellectual functions of prefrontal | Medical | |

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| | association cortex | Physiology | |
| | Explain the mechanism of consolidation of memory | | |
| | Explain retrograde and anterograde amnesia | | |
| | Explain the physiological basis and features of Alzheimer's disease | | |
| NS-P-026 | Enlist the areas of speech | | Speech |
| | Explain the functions of motor and sensory areas of speech | | |
| | Trace and explain the pathway of written and heard speech | | |
| | Enlist the abnormalities of speech | | |
| | Explain the features of motor aphasia | | |
| | Elaborate the features of sensory aphasia | | |
| | Define dyslexia, alexia, agraphia | | |
| NS-P-027 | Discuss Components of Autonomic nervous system | Medical Physiology | ANS |
| | Explain the physiological anatomy of sympathetic and parasympathetic nervous system | | |
| | Describe the types of adrenergic and cholinergic receptors | | |
| | Explain the effects of sympathetic and parasympathetic on various organs/ system of body | | |
| **CODE** | **MEDICAL BIOCHEMISTRY** | **TOTAL HOURS = 20** | |
| | **SPECIFIC LEARNING OBJECTIVES** | **DISCIPLINE** | **TOPIC** |
| NS-B-001 | Explain the digestion and absorption of lipids with enzymes involved in it. Discuss role of bile acids and salts in lipid digestion and absorption | Medical Biochemistry | Digestion and absorption of lipids |
| NS-B-002 | Explain the concept of lipid transport and storage | | Lipid transport and storage |

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| NS-B-013 | Explain the role of genetics in cancers especially breast, ovary, lung and colon. | | Cancer |
| NS-B-014 | Discuss the concept of xenobiotics. | | Xenobiotics |

## PRACTICAL

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 14 | |
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| | | DISCIPLINE | TOPIC |
| NS-B-015 | Interpret the lysosomal storage diseases on given data Neiman pick disease, Gaucher's disease etc. | Biochemistry Practical | Data Interpret |
| NS-B-016 | Perform the estimation of triglycerides by kit method | | Triglycerides estimation |
| NS-P-028 | Examine the Sensory System | Physiology Practical | Sensory system |
| NS-P-029 | Examine the Superficial Reflexes | | Superficial Reflexes |
| NS-P-030 | Examine the Deep Reflexes | | Deep Reflexes |
| NS-P-031 | Demonstrate Cerebellar Function Test | | Cerebellar Tests |
| NS-P-032 | Demonstrate the testing of Cranial Nerve (CN) VII | | CN VII |
| NS-P-033 | Demonstrate the Testing of Cranial Nerves (XI, XII) | | CN X, XI, XII |
| NS-P-034 | Examine the Motor system | | Motor system |

## PATHOPHYSIOLOGY AND PHARMACOTHERAPEUTICS

| CODE | SPECIFIC LEARNING OBJECTIVES | TOTAL HOURS = 05 | |
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| | | DISCIPLINE | TOPIC |
| NS-Ph-001 | 1.Classify various opioid receptors<br>2.Describe Mechanism of Action (MOA), pharmacological actions, clinical uses and adverse effects of opioid agonist, mixed agonist -antagonist and antagonist | Pharmacology | Opioids |
| NS-Ph-002 | 1.Classify various CNS stimulants and depressants<br>2.Describe MOA, pharmacological actions, clinical uses and adverse effects of CNS stimulant and | | CNS stimulants & depressants |