



DEPARTMENT OF PHYSIOLOGY

Lecture hours	Small group teaching/tutorials/ integrated teaching/ practical (hours)	Self-directed learning (hours)	Total (hours)
160	315	20	495

Guidelines for Organization of Classes and Assessments under Revised Curriculum

- **Theory and Practical Classes shall be organized in accordance with the revised curriculum, ensuring coverage of all prescribed competencies.**
- **To achieve the objectives of each competency, the number and mode of sessions—lectures, small group teaching, tutorials, integrated teaching, and self-directed learning—may be determined by each college, provided the curriculum guidelines are fulfilled. Alignment of topics across subjects and coverage of portions for internal assessments must be ensured.**
- **In lieu of common university internal assessment examinations, and to maintain uniform standards among MBBS students, the Board of Studies, Dr. NTR University of Health Sciences, recommends specific objectives/concepts to be learned by every student for each competency.**
- **The teacher/facilitator is expected to frame clear, specific learning objectives for each session, based on the revised competency-based curriculum guidelines.**
- **Internal assessment questions will be drawn from the objectives outlined in this document**

ANATOMY	PHYSIOLOGY	BIOCHEMISTRY
Syllabus to be taught before the 1st Internal Assessment Examination		
GENERAL ANATOMY, UPPER LIMB, GENERAL HISTOLOGY, GENERAL EMBRYOLOGY, LOWER LIMB.	GENERAL PHYSIOLOGY, NERVE MUSCLE PHYSIOLOGY, HEMATOLOGY, ENDOCRINE SYSTEM	CELL, ENZYMES, HEMOGLOBIN STRUCTURE & FUNCTION, ABNORMAL HEMOGLOBIN, VITAMINS, protein chemistry, IRON, CALCIUM, PLASMA PROTEINS, BIOLOGICAL OXIDATION, INTERMEDIARY METABOLISM INTRODUCTION, HORMONES
1st INTERNAL ASSESSMENT – 2nd WEEK OF DECEMBER 2026 (Dates shall be informed by the University in advance.)		
Syllabus to be taught before the 2nd Internal Assessment Examination		
HEAD & NECK, BRAIN	CNS, RENAL SYSTEM, ACID- BASE BALANCE	CARBOHYDRATE CHEMISTRY & METABOLISM, PROTEIN METABOLISM, LIPID CHEM & METABOLISM, WATER ELECTROLYTE, ACID-BASE BALANCE
2nd INTERNAL ASSESSMENT – 3rd WEEK OF MARCH 2027 (Dates shall be informed by the University in advance.) *The Practical Exams for the internal assessment may be completed before the theory examinations of the internal assessment as per the convenience of the institution.		
Syllabus to be taught before the 3rd Internal Assessment Examination		
THORAX, ABDOMEN, PELVIS, PERINEUM	CARDIOVASCULAR SYSTEM, RESPIRATORY SYSTEM, GIT, REPRODUCTIVE PHYSIOLOGY, INTEGRATED PHYSIOLOGY	NUCLEOTIDE CHEMISTRY & METABOLISM, , INTEGRATION OF METABOLISM, MOLECULAR BIOLOGY, ECM, ORGAN FUNCTION TESTS, CARCINOGENESIS, FREE RADICALS, DETOXIFICATION, IMMUNOLOGY, NUTRITION, MINERAL METABOLISM.

<p>PRE FINAL EXAM –2nd WEEK OF AUGUST 2027 (Dates shall be informed by the University in advance.)</p>		

***The portion for the Pre Final Exam (3rd Internal Assessment Exam) includes entire syllabus of the subject.**

****The Practical Exams for the internal assessment may be completed before the theory examinations of the internal assessment as per the convenience of the institution.**

GENERAL PHYSIOLOGY

Sl no	Competency	LECTURE	SDL	TUT/SGT/PRAC	DOMAIN/LEVEL/CORE	OBJECTIVES	Base book	Reference book
PY 1.1	Structure and function of mammalian cell				K-KH-Y	<ol style="list-style-type: none"> 1. Structure of biological membrane, its chemical composition & functions, Significance of Fluid mosaic model 2. Types of membrane proteins – (integral and peripheral proteins) – and their functions 3. Structure and functions of different cell organelles – <ol style="list-style-type: none"> a. Role of Free ribosomes in the synthesis of cytosolic proteins and Rough endoplasmic reticulum(RER) in the synthesis, folding and post-translational modification of secretory and membrane proteins b. Role of Golgi apparatus in post-translational modification and sorting of RER synthesized proteins, constitutive & non-constitutive pathway c. Role of chaperones d. Role of Lysosomes – intravesicular pH 	Berne & Levy Physiology	Boron and Boulpep Ganong's physiology Alberts molecular biology of cell

						<ul style="list-style-type: none"> e. Proteasomes in protein turnover of membrane bound and cytosolic compartment f. Mitochondria- energy production, apoptosis, mitochondrial inheritance g. , Peroxisomes, smooth endoplasmic reticulum <ul style="list-style-type: none"> 4. Regulation of genetic expression: Regulation at the level of chromatin remodeling, initiation of transcription, Transcript elongation, termination of transcription, post-translational RNA processing (splicing, capping, cleavage, polyadenylation), nucleocytoplasmic transport, translation, mRNA degradation. 5. Clinical aspects of abnormal gene expression. 		
PY1.2.	Principles of homeostasis				K-KH-Y	<ul style="list-style-type: none"> 1. Evolutionary aspects of living systems & Thermodynamics of living systems 2. Outlines of control systems- sensor, centre ,effectors , Concept of Gain, Transfer function, Error , set point of control systems in homeostasis 3. Milieu interior and Need for homeostasis in human body, concept of steady state balance 	Guyton	<p>Boron and Boulpep</p> <p>Berne & Levy Physiology</p> <p>Mount castle physiology</p>

						<ul style="list-style-type: none"> 4. Different Mechanisms of homeostasis: Feedforward, feedback- positive and negative feedback with examples 5. Compare and contrast feedback and feedforward mechanisms with respect to time kinetics, stability and error in homeostatic control. 6. Heterostasis, Allostasis, Allodynamic regulation, adaptive control 		
PY1.3	Intercellular communication				K-KH-Y	<ul style="list-style-type: none"> 1. General overview of mechanisms of cellular communication- <ul style="list-style-type: none"> a. Communication by direct interactions: Cell-cell junctions and cell-matrix junctions ,cell adhesion molecules : cadherins, integrins,immunoglobulin superfamily,selectins b. Cytoskeleton – (microtubules, intermediate filaments and microfilaments) - and their functions., Molecular motors- Myosin, Dyenin, Kinesin and their functions c. Communication by chemical signals <ul style="list-style-type: none"> i. Ligand-gated ion channels, GPCRs, 	Boron and Boulpe p	Berne & Levy Physiology Best and taylor physiology

						<p>catalytic receptors, Nuclear receptors ii. Second messengers</p>		
PY 1.4	Apoptosis – programmed cell death				K-KH-Y	<ol style="list-style-type: none"> 1. Definition 2. Nomenclature 3. Difference b/n Apoptosis & Necrosis 4. Mechanisms <ol style="list-style-type: none"> a. role of mitochondria & caspases b. p53 gene 5. Apoptosis during development <ol style="list-style-type: none"> a. CNS b. Immune system c. Regression of ducts in sexual development 6. Apoptosis during adulthood <ol style="list-style-type: none"> a. Menstruation b. Enterocytes 7. Abnormal apoptosis <ol style="list-style-type: none"> a. Autoimmune diseases b. Neuro degenerative diseases c. Cancer 	Boron and Boulpe p	Robbins text book of pathology, Alberts molecular biology of cell
PY 1.5	Body fluids, its ionic composition and measurements				K-KH-Y	<ol style="list-style-type: none"> 1. Normality, molarity, molality, osmolality, osmolarity, equivalents, tonicity, reflection coefficient, serum osmolality and its determinants 2. Volumes and composition of various body fluid compartments- 	Boron and Boulpe p	Berne & Levy Physiology & Best and Taylor Physiology

						<p>ICF, ECF (interstitial fluid, Blood volume, plasma volume and transcellular fluid) and their significance</p> <ol style="list-style-type: none"> 3. Effect of volume occupied by plasma proteins, protein charge on plasma ionic concentration, gibbs-donnan effect 4. Principle of osmotic balance and electroneutrality across various body fluid compartments. 5. Effect of hypotonic, hypertonic & isotonic fluid loss and gain on volume and osmolality of body fluid compartments 6. Physiological basis of fluid replacement therapy 7. Measurement of volume in different body fluid compartments 		(measurements)
PY 1.6	Transport mechanisms across cell membrane				K-KH-Y	<ol style="list-style-type: none"> 1. Energetics of transport across cell membrane -Passive transport & Active transport 2. Passive transport- electrical and chemical gradients 3. Different types of passive transport- simple vs facilitated diffusion, Ficks law for rate of simple diffusion, reflection coefficient, michaeli-menton (saturation) kinetics for rate of facilitated diffusion. 4. Active transport- Primary vs Secondary active transport 	Boron and Boulpe p	Berne & Levy Physiology, Best and taylor

						<ol style="list-style-type: none"> 1. Pores, ion channels, carriers, ATPase Pumps- Na-K Pump, ABC transporters, Channelopathies 5. Uniport, Symport, antiport 6. Vesicular transport- Endocytosis & Exocytosis, Constitutive & non-constitutive pathways, caveolae, lipid rafts 7. Transcytosis 8. Transport across epithelium- Paracellular transport, filtration, bulk flow of water 		
PY 1.7	Concept of pH & Buffer systems in the body					REFER PY 7.5		
PY 1.8	Molecular basis of resting membrane potential and action potential in excitable tissue				K-KH-Y	<ol style="list-style-type: none"> 2. Introduction to biopotentials, magnitude, types 3. Diffusion potentials, Nernst potential/Equilibrium potentials, Gibb's Donnan equilibrium & Potentials, 4. Genesis of resting membrane potential-contribution of electrodiffusion, Gibbs-donnan effect and Na-K Pump, Goldman-Hodgkin-Katz equation. 5. Recording of potentials-CRO, Digital; Voltage clamps & Patch clamp techniques 6. Electrical equivalent circuit model of cell membrane 	Boron and Boulpe p &	<p>Best and taylor Physiology</p> <p>Berne & Levy Physiology</p> <p>Mount castle physiology</p>

						<p>7. Local potential, cable properties-time constant & length constant.</p> <p>8. Excitability and Strength duration curve- concept of chronaxie, utilization time and rheobase</p> <p>9. Physiology of voltage-gated ion channels and genesis, propagation, properties of action potential- all-or-none, Threshold, refractory period (absolute , relative and effective)</p> <p>10. Factors affecting the conduction velocity of action potential in axon-myelination & diameter of axon, saltatory conduction</p>		
PY 1.9	Methods used to demonstrate the functions of cell and its products, its communications and their applications in clinical care research				K-KH-Y	<p>The student must be familiar with following terms & techniques at a conceptual level:</p> <p>Cell isolation, cell culture, cell lines and their applications in medicine, Chromatography, HPLC, Immuno-precipitation, purified cell free systems, SDS-PAGE, Immunoblotting, Mass spectrometry, MALDI,LCMS, FRET, NMR, X-ray Crystallography, protein sequencing and BLAST search, PCR,RT-PCR,DNA & RNA Sequencing, NGS, Genome annotation, Whole genome and Whole exome sequencing, SNPs and genome wide association studies, gene knockout, gene silencing</p>	Internet	Alberts molecular biology of cell

						and RNA interference, genome editing & CRISPR technique, Microarray, RNA-seq, Fluorescence microscopy, confocal imaging, voltage sensitive and ion concentration sensitive indicators, Atomic force microscopy, Scanning electron microscopy, Optogenetics		
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HEMATOLOGY

Comp . No.	COMPETENCY	LECT URE No. Of HOURS	PRAC/SGD/ Tut/ Int hrs	SDL hrs	DOMAI/LEVEL/COR E	OBJECTIVES	BASE BOOK	REFEREN CE BOOK
PY2. 1	Composition and Functions of blood components				K-KH-Y	<ol style="list-style-type: none"> 1. Blood components <ul style="list-style-type: none"> • Plasma: plasma proteins,electrolytes, small organic molecules • Formed elements 2. Normal hematocrit 3. Difference between serum & plasma 4. Functions of Blood 5. Normal blood volume per Kg body weight at different ages,males, females 	Boron and Boulp aep &	Best & Taylor
PY2. 2	Origin, forms,variations and functions of plasma proteins				K-KH-Y	<ol style="list-style-type: none"> 1. Methods of separation of plasma proteins, Electrophoretic pattern of human plasma 2. Principal plasma proteins- albumin, plasma proteolytic systems (coagulation system, fibrinolytic system, kinin system, complement system), plasma protease inhibitors, gamma globulins ,carrier proteins and acute phase proteins. 	Best & Taylor	Guyton

						<ol style="list-style-type: none"> 3. Synthesis of different Plasma Proteins-role of liver, plasma cells, WBC, distribution and catabolism of plasma proteins 4. Properties of Plasma Proteins-plasma half-life,size,charge and their functions 5. Normal values of plasma proteins 6. Clinical aspects – Acute phase response, ESR, Hyperproteinemias, Hypoproteinemia, Afibrinogenemia 7. Whipples Plasmapheresis 		
PY2. 3	Synthesis & functions of haemoglobin and explain its breakdown. Variants of hemoglobin.				K-KH-Y	<ol style="list-style-type: none"> 1. Structure - heme ring , globin 2. Biosynthesis of haemoglobin: critical balance between iron assimilation, heme & Globin synthesis 3. Haemoglobin catabolism 4. Functional properties and structural properties of haemoglobin- 5. Different types of haemoglobin <ul style="list-style-type: none"> ○ Normal variants: embryonic, Fetal and adult haemoglobin ○ Abnormal variants of haemoglobin: methemoglobin, sulfhemoglobin, carboxyhemoglobin 6. Thalassemia 	Best & Taylor	Wintrobe's clinical hematology

						7. Hemoglobinopathies (sickle cell anemia)		
PY2.4	RBC formation & function				K-KH-Y	<ol style="list-style-type: none"> 1. hemopoiesis- sites at different phases of life 2. Concept of erythron, 3. different stages of erythropoiesis: <ul style="list-style-type: none"> ○ differentiation of erythroid cells from multipotent hematopoietic stem cells 4. Factors regulating erythropoiesis <ul style="list-style-type: none"> ○ Hematopoietic microenvironment ○ Normal population of hematopoietic stem cells ○ Hematopoietic growth factors- <ul style="list-style-type: none"> ▪ Erythropoietin: synthesis & secretion, physiological actions ○ Nutrient availability: folic acid, Vitamin B12, IRON 5. Morphology of mature RBC : <ul style="list-style-type: none"> ○ Significance of biconcave disc shape ○ Factors affecting RBC deformability and its importance 6. Red cell metabolism 7. Polycythemias 	Guyton Best & Taylor	Wintrobe's clinical hematology Samson & wright physiology
					K-KH-Y	1. Different blood indices: importance of RDW and MCV, MCH, MCHC	Guyton	Wintrobe's clinical

PY2. 5	Anaemia & jaundice				K-KH-Y	<ol style="list-style-type: none"> 2. Classification of anemia 3. Pathophysiology, symptoms, blood picture & treatment of pernicious anemia, megaloblastic anemia, iron deficiency anemia & aplastic anemia 4. Definition of jaundice 5. Normal values of serum bilirubin 6. Latent jaundice and clinical jaundice 7. Types of jaundice , clinical features and treatment 	Best & Taylor	hematology
PY2. 6	WBC formation & regulation				K-KH-Y	<ol style="list-style-type: none"> 1. Classification of WBC 2. Hematopoietic growth factors 3. LEUCOPOEISIS: 4. Kinetics of granulocyte production, three pools of granulocytes <ol style="list-style-type: none"> a. Marrow pool b. Circulating granulocyte pool c. Marginating granulocyte pool 5. Production and fate of monocytes-macrophages, eosinophils, basophils, mast cells. 6. Morphology and function of leucocytes 7. Different types of tissue macrophages 8. Leucocytosis & leucopenia 	Best & Taylor Guyton	Wintrobe's clinical hematology

						9. Causes and mechanisms of physiological leucocytosis 10. Leukemia & Leukemoid reaction		
PY2. 7	Formation of platelets , functions & variations				K-KH-Y	1. Stages and regulation of thrombopoiesis, thrombopoietin, structure, metabolism and functions of platelets 2. Platelet granules and contents 3. Mechanism of temporary haemostatic plug: <ul style="list-style-type: none"> ○ platelet adhesion & vWF ○ Platelet activation, ○ Platelet shape change ○ Platelet aggregation, ○ Platelet secretion 4. Disorders of platelet number: thrombocytopenia, thrombocytosis 5. Disorders of platelet function: thrombasthenia	Best & Taylor	Wintrobe's clinical hematology
PY2. 8	Physiological basis of hemostasis and anticoagulants. Bleeding & clotting disorders				K-KH-Y	1. Different types of clotting factors 2. Theories of coagulation <ul style="list-style-type: none"> ○ Cascade model: intrinsic, extrinsic and common pathway, limitations of cascade model ○ Cell-based model of coagulation: initiation, amplification, propagation & termination phase of coagulation 3. Endogenous anticoagulants:	Boron & Boulpaep	Best & Taylor Wintrobe's clinical hematology

						<ul style="list-style-type: none"> ○ Paracrine factors: PGI₂, NO ○ Anticoagulant factors: TFPI, AT-III, Thrombomodulin, protein c & s <ol style="list-style-type: none"> 4. Fibrinolytic and anti-fibrinolytic system 5. Tests of coagulation 6. pathophysiology and clinical features in disorders of primary hemostasis (platelet) and secondary hemostasis (clotting factor abnormalities) 7. Clinical uses of anticoagulants 		
PY2. 9	Blood groups, blood banking & transfusion				K-KH-Y	<ol style="list-style-type: none"> 1. Different blood group systems and their importance 2. Molecular biology of ABO & Rh system: Landsteiner's laws, Bombay phenotype, Minor blood group systems 3. Clinical and medico-legal importance of blood Grouping and cross matching 4. Indications and hazards of blood transfusion, clinical physiology of mismatched blood transfusion, blood banking, storage of blood 5. Erythroblastosis foetalis 6. Blood and plasma substitutes 	Best & Taylor guyton	Wintrobe's clinical hematology

<p>PY2. 10</p>	<p>Classify immunity. Development of immunity & its regulation</p>				<p>K-KH-Y</p>	<ol style="list-style-type: none"> 1. Innate immunity Vs Adaptive immunity 2. Innate immunity <ol style="list-style-type: none"> a. Physical & chemical barriers, inflammatory response, PAMPs (pathogen associated molecular patterns) & DAMPs (disease associated molecular patterns), PRRs (pattern recognising receptors- TLR, NLR,RLR) b. Phagocytosis, Oxidative & Non-oxidative mechanisms of microbial destruction by phagocytes, antimicrobial peptides, 3. Complement system 4. Adaptive immunity <ol style="list-style-type: none"> a. Antigen presenting cells, Types of B-cells(plasma cells) and T-cells (CD4 Tcells , CD8 T cells), Major Histocompatibility complex (MHC-I & MHC-II), clonal selection theory, Co-stimulation b. Humoral immunity:Structure of antibodies, types and functions of antibodies, Pre-antigen exposure antibody diversity –combinatorial & 	<p>Ganongs physiology</p>	<p>Janeways immunobiology</p>
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						<p>junctional diversity, Post-antigen exposure antibody diversity- affinity maturation, somatic hypermutation, Isotype-class switching,</p> <p>c. Cell mediated immunity: Critical role of CD4 Tcells in initiation of adaptive immunity, role of professional APC, functions of CD8 T cells</p> <p>d. Immunotolerance- central and peripheral tolerance, maternal immunotolerance of fetus autoimmunity transplantation immunity.</p>		
PY2. 11	Estimation of Hb, RBC, TLc, DLC, Blood groups, BT,CT			DOA P	S-SH-Y	<p>Student should be able to:</p> <ol style="list-style-type: none"> 1. Estimate hemoglobin from his/her own blood sample, calculate oxygen carrying capacity of his/her own or given blood sample 2. Estimate RBC count from his/her own or given blood sample 3. Estimate WBC count from his/her own or given blood sample 4. Perform peripheral blood smear from his/her own or given blood sample and determine the differential leucocyte count 5. Determine the blood group and Rh type from his/her own or given blood sample 	C.L. Ghai A.K.JAIN	Dacie & lewis practical hematology

						6. Determine his/her own bleeding and clotting time accurately		
PY2. 12	Test for ESR, Osmotic fragility, Hematocrit, RBC indices.			DEMONSTRATION	K-KH-Y	<p>Student should be able to:</p> <ol style="list-style-type: none"> 1. Explain the clinical importance of doing ESR, Name the methods used to determine ESR, understand the concept of zeta potential and its role in rouleaux formation, physiological basis of conditions where ESR is altered 2. Define the osmotic fragility of RBC and describe the utility of the test, understand and explain the effect of hypotonic and hypertonic saline on RBC, Name the clinical conditions in which the RBC fragility is altered 3. Define hematocrit and explain its clinical importance, name the conditions in which hematocrit is altered. 4. Name and calculate the RBC indices (MCV, MCH, MCHC), explain the clinical significance of RBC indices, understand the RDW (red cell distribution width) and its clinical importance 	C.L. .Ghai A.K.Jain	Dacie & Lewis practical hematology
PY2. 13	Reticulocyte count & platelet count			DEMONS	K-KH-Y	Student should be able to:	C.L. Ghai	Dacie & Lewis practical

	principles			TRATION		1. Explain the significance of reticulocyte count and platelet count	A.K.Jain	hematology
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NERVE MUSCLE PHYSIOLOGY								
Comp. No.	COMPETENCY	LECTURE No. Of HOURS	PRAC/SGD/Tut/Int hrs	SDL hrs	DOMA/L EVEL/CORE	OBJECTIVES	BASE BOOK	REFERENCE BOOK
PY3.1	Neuron, neuroglia, neurotransmitters and nerve growth factors/cytokines				K-KH-Y	<ol style="list-style-type: none"> 1. Structure-function relationships of specialized regions of neuron- cell body, dendrites, axon and presynaptic terminals, physiological role of dendritic spines. 2. Role of neuronal cytoskeleton & axoplasmic transport- fast anterograde, fast retrograde and slow anterograde transport, axoplasmic transport of toxins and viruses 	Ganongs review of physiology	Boron and Boulpep Berne & Levy Physiology

						<ol style="list-style-type: none"> 3. Types of neurons based on structure- axonal projections, dendritic pattern and number of processes 4. Types of neuroglia 5. Functions of astrocytes- nutritional role, K⁺ handling & spatial buffering, neurotransmitter handling, trophic factor secretion, Blood-brain barrier and blood flow regulation 6. Functions of oligodendrocytes & Schwann cells 7. Functions of microglia 8. Classification of neurotransmitters 9. Excitotoxicity 10. Types and Functions of nerve growth factors: neurotrophins and their receptors 		
PY3. 2	Types, functions and properties of nerve fibers.				K-KH-Y	<ol style="list-style-type: none"> 1. Structure of Nerve fibre 2. Properties of nerve fibres 3. Compound action potential of nerves 4. Different classifications of nerve fibres-Erlanger-Gasser classification & numerical classification 5. Pathophysiology of Differential susceptibility of nerve fibres to hypoxia, anesthesia and pressure 	Ganongs review of physiology Boron and Boulpep	Boron and Boulpep Berne & Levy Physiology
PY3. 3	Degeneration and							

	regeneration of nerve fibers					<ol style="list-style-type: none"> 1. Neural regeneration in central and peripheral nervous system 2. Classification of nerve injuries- Degeneration (wallerian degeneration) & regeneration of nerve fibres after nerve injury –role of neurotrophins, glial cells and neuronal microenvironment 		
PY3.4	Neuromuscular junction and transmission of impulses				K-KH-Y	<ol style="list-style-type: none"> 1. Structure-function relationships at NMJ, Molecular biology of Ach synthesis, synaptic vesicle storage and release by exocytosis, reuptake or degradation. 2. Molecular physiology of Ach- Nicotinic acetyl choline receptor interaction 3. Miniature end plate potential and quantal release of neurotransmitter 4. end plate potential and Safety factor for neuromuscular transmission 	Berne & Levy Physiology	<p>Boron and Boulpep</p> <p>Ganong's physiology</p> <p>Best and Taylor Physiology</p>
PY3.5	Neuromuscular blockings agents and NMJ disorders				K-KH-Y	<ol style="list-style-type: none"> 1. Toxins affecting NMJ- molecular physiology of Tetrodotoxin, saxitoxin, dendrotoxins, conotoxins, tetanus and botulinum toxins 2. Drugs affecting neuromuscular junction- Agonists and 	Berne & Levy Physiology	<p>Boron and Boulpep &</p> <p>Ganong's</p>

PY3.6	Pathophysiology of myasthenia gravis				<p>antagonists of Nicotinic Ach receptors, inhibitors of acetyl cholinesterase.</p> <p>3. Pathophysiology, clinical features and management of Myasthenia gravis & Lambert Eaton myasthenic syndrome,</p>		<p>physiology</p> <p>Best and Taylor Physiology</p>
PY3.7	Types of muscle fibers and their structure				<p>1. Smooth muscle</p> <ul style="list-style-type: none"> ○ Structure-function relationships of single unit & multi-unit smooth muscle, neurotransmitter and hormone receptors on smooth muscle <p>2. Cardiac muscle</p> <ul style="list-style-type: none"> ○ Intercalated discs, gap junctions, sarcomere structure, triads and their location <p>3. Skeletal muscle</p> <ul style="list-style-type: none"> ○ sarcomere structure, SR, triads ○ Properties of Slow-type, twitch type- slow fatigue resistant, fast fatigue resistant, fast fatiguable. ○ Morphological properties ○ Histochemical properties 	Berne & Levy Physiology	<p>Boron and Boulpaep &</p> <p>Best and Taylor Physiology</p>

						<ul style="list-style-type: none"> ○ Contractile and regulatory proteins 		
PY3.8	Action potential and its properties in skeletal muscle and smooth muscle				K-KH-Y	<ol style="list-style-type: none"> 1. Smooth muscle: graded potentials, action potentials-physiology of spike potential, plateau potentials, slow waves, basal electrical rhythm, pacemaker activity in multi-unit smooth muscle 2. Skeletal muscle: spike potentials, role of T-tubule system, 	Boron and Boulpep	Berne & Levy Physiology, Best and Taylor
PY3.9	Molecular basis of muscle contraction in skeletal and smooth muscle				K-KH-Y	<ol style="list-style-type: none"> 1. Smooth muscle: absence of typical sarcomeric organization, excitation-contraction coupling and pharmaco-mechanical coupling, ca-Calmodulin mediated cross bridge activation, Smooth muscle plasticity, latch bridge mechanism, stress relaxation and reverse stress relaxation, source of Ca²⁺ for contraction 2. Skeletal muscle: excitation-contraction coupling, source of ca²⁺ for Skeletal muscle contraction, ryanodine receptors, Dihydropyridine 	Berne & Levy Physiology	Guyton Boron and Boulpep & Best and Taylor Physiology

						receptors, physiology skeletal muscle relaxation: role of ATP & cytosolic Calcium depletion, Rigor mortis		
PY3.10	Modes of muscle contraction				K-KH-Y	<ol style="list-style-type: none"> 1. isometric contraction 2. isotonic contraction <ol style="list-style-type: none"> a. concentric contraction b. eccentric contraction 3. isokinetic contraction 4. auxotonic contraction 	Boron and Boulpep	<p>Berne & Levy Physiology</p> <p>Best and Taylor Physiology</p> <p>Silverthorne physiology</p>
PY3.11	Energy source and Muscle metabolism				K-KH-Y	<ol style="list-style-type: none"> 1. Energy source for muscle contraction <ol style="list-style-type: none"> a. Immediate : Muscle phosphagens- ATP, Phosphocreatinine b. Anaerobic glycolysis c. Long term source of ATP: Oxidation of glucose, lactate and fatty acids <ol style="list-style-type: none"> i. Oxidation of non-muscle glucose,oxidation of lactate, 	Ganongs physiology	Best and Taylor Physiology

						<p>gluconeogenesis , oxidation of non-muscle lipid</p> <p>2. Physiology of muscle fatigue, O2 debt</p> <p>3. Heat production by muscle: initial heat, maintenance heat, relaxation heat, recovery heat, activation heat, shortening heat, thermoelastic heat., fenn effect</p>		
PY3. 12	Gradation of muscular activity				K-KH-Y	<p>1. Motor unit, innervation ratio, motor unit types- I,IIA,IIB</p> <p>2. Elastic elements of skeletal muscle & force generation: active vs passive tension</p> <p>3. Determinants of force produced by muscle</p> <p>a. Isometric Length-tension relationship</p> <p>b. Isotonic Force-velocity relationship</p> <p>c. Summation</p> <p>i. Multimotor unit summation: recruitment, physiological basis of size principle</p> <p>ii. Frequency summation</p>	Berne & Levy Physiology	<p>Boron and Boulpep</p> <p>Best and Taylor Physiology</p>
PY3. 13	Muscular dystrophies and myopathies				K-KH-Y	<p>1. Hypertrophy, atrophy, dystrophy</p> <p>2. Pathophysiology of Duchenne muscle dystrophy, Beckers</p>	Ganong's physiology	Harrison's principle

						muscle dystrophy, Limb-girdle, Emery-Dreifuss, congenital, fascio-scapulo-humeral, myotonic, oculopharyngeal. 3. Congenital, mitochondrial myopathies.		s of internal medicine
PY 3.14	Ergography				K-KH-Y	The student should be able to: 1. Define ergography 2. Perform Mosso's ergography 3. List the precautions to be taken during the procedure 4. Calculate the work done 5. Define fatigue and list the factors that cause fatigue 6. Name the sites of fatigue in human beings 7. Explain the effect of motivation, venous and arterial occlusion on the work done	A.K.JAIN	
PY 3.15	Demonstrate the effect of mild, moderate & severe exercise and record the changes in cardiorespiratory parameters				K-KH-Y	REFER PY 5.12		
PY 3.16	Demonstrate Harvard step test & describe the impact on induced				K-KH-Y	The student should be able to: 1. List exercise tolerance / stress tests to assess cardiac efficiency 2. Perform Harvard step test	A.K.JAIN	

	physiologic parameters in a simulated environment					<ol style="list-style-type: none"> 3. List the precautions to be taken during the procedure 4. Calculate cardiac efficiency index 5. Define cardiac reserve and explain its significance 		
Student PY 3.17	Strength-duration curve				K-KH-Y	REFER PY 1.7		
PY 3.18	<p>Observe with computer assisted learning</p> <ol style="list-style-type: none"> 1. Amphibian nerve muscle experiments 2. Amphibian cardiac experiments <ul style="list-style-type: none"> • Properties of nerve-muscle & heart may also be demonstrated using digital 			DOAP / Demonstration	S-KH-Y	<p>The student should be able to :</p> <ol style="list-style-type: none"> 1. Explain effect of temperature on simple muscle twitch 2. Explain the effect of warm and cold ringer on muscle contraction and their physiological basis 3. Define stimulus, adequate stimulus, list types of stimuli and different grades/intensities of stimulus 4. Explain the Effect of increasing strength of stimuli on muscle contraction 5. Explain the effect of two successive stimuli on muscle contraction ,Define absolute and relative refractory period, explain the physiological basis of beneficial effect 6. Explain the effect of multiple successive stimuli on muscle contraction 	A.K.JAIN	

	<p>physiographs in institutions where such systems are available</p>				<ol style="list-style-type: none"> 7. Explain the effect of continued stimulation on muscle contraction, Describe the effect of direct stimulation of muscle after onset of fatigue and the recovery curve. 8. Define preload and afterload and list the differences between them, Effect of load on muscle contraction 9. Explain the nerve conduction velocity and factors that affect it, Explain the significance of determining nerve conduction studies in clinical physiology 10. Explain the phases of normal cardiogram 11. Explain the effect of temperature on normal cardiogram 12. list out the properties of cardiac muscle and explain the physiological basis of each, Explain why cardiac muscle cannot be tetanised 13. Explain the Phenomenon of vagal escape 14. Explain the effect of ions (sodium, potassium & calcium) on heart 15. Explain the effect of adrenaline, noradrenaline, 		
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						acetyl choline & atropine on heart		
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GASTROINTESTINAL PHYSIOLOGY

Comp . No.	COMPETENCY	LECT URE No. Of HOUR S	PRAC/ SGD/ Tut/ Int hrs	SDL hrs	DOMAIN/LEV EL/CORE	OBJECTIVES	BASE BOOK	REFEREN CE BOOK
PY4. 1	Structure & function of digestive system				K-KH-Y	<ol style="list-style-type: none"> 1. Functional anatomy of GIT 2. Cellular specializations in the GIT 3. Regulatory mechanisms of the GIT <ul style="list-style-type: none"> ○ Endocrine ○ Paracrine ○ Neural regulation <ul style="list-style-type: none"> ▪ Extrinsic innervations of GIT ▪ Intrinsic neural innervation 	BERN E & LEVY	Boron GANONG Best & Taylor

						<ul style="list-style-type: none"> ○ Enteric nervous system/ Mini brain <ul style="list-style-type: none"> ▪ Auerbach's plexus, Meissners plexus 4. Electrophysiology of Gastrointestinal Smooth muscle – INTERSTITIAL CELLS OF CAJAL (PACEMAKER CELLS) 5. Neurotransmitters of GIT 6. Splanchnic circulation, portal circulation 7. Lymphatic drainage of GIT & its functional importance 		
PY4.2	Composition, mechanism of secretion, functions & regulation of saliva, gastric, pancreatic, intestinal juices and bile secretion				K-KH-Y	<ul style="list-style-type: none"> • Types and Innervation of salivary glands • Composition of salivary secretion <ul style="list-style-type: none"> ○ Primary & secondary secretion • Mechanisms of salivary secretion- role of acinar cells & ductular cells • Phases & Regulation of salivary secretion • Functions of saliva 	BERN E & LEVY	<p>Boron GANONG</p> <p>Best & Taylor</p> <p>Boron</p>

						<ul style="list-style-type: none"> • Functional anatomy of stomach • The three functional divisions of stomach- LES/cardia, Proximal & distal stomach- secretory & motility functions • Composition of gastric secretion- inorganic & organic constituents • Cellular mechanisms of <ul style="list-style-type: none"> ○ Gastric acid secretion <ul style="list-style-type: none"> ▪ Parietal cell receptors ▪ Role of gastrin, histamine & vagus ▪ Physiology of proton pump ○ Bicarbonate & mucus secretion ○ Pepsinogen secretion • Phases & Regulation of gastric secretion- endocrine, paracrine & neurocrine mechanism • Protective mechanisms of gastric epithelium <ul style="list-style-type: none"> ○ Gastric mucosal barrier • Sham feeding & Pavlov's pouch • Functions of stomach • Structure function relationships of acinar cells & ductal cells 	BERN E & LEVY	Boron
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						<ul style="list-style-type: none"> • Composition of pancreatic juice-products acinar cells • Phases of pancreatic secretion & neurohumoral regulation <ul style="list-style-type: none"> ○ Characteristics & control of acinar cell secretion-role of cholecystokinin ○ Characteristics & control of ductal cells –role of secretin • Mechanisms that protect pancreas from autodigestion & pathophysiology of pancreatitis • pathophysiology of cystic fibrosis 	BERN E & LEVY	Boron
						<ul style="list-style-type: none"> • Overview of fluid and electrolyte movement in small intestine • Cellular mechanisms of Na, Cl & K absorption and secretion • Regulation of intestinal ion transport • Composition of succus entericus 	BERN E & LEVY	Boron
						<ul style="list-style-type: none"> • Microscopic structure of large intestine • Cellular mechanisms of active and passive K absorption and secretion 	BERN E & LEVY	

						<ul style="list-style-type: none"> • Secretion and absorption in large intestine • Composition of large intestinal juice • Composition of bile- hepatic & gall bladder bile • Physiology of bile secretion & its regulation <ul style="list-style-type: none"> ○ Hepatocyte canalicular secretory mechanisms ○ Ductal modification of bile- role of cholangiocytes ○ Gall bladder modification of bile • Bile acid dependant & bile acid independent canalicular bile flow • Enterohepatic circulation of bile acids <ul style="list-style-type: none"> ○ Intestinal reabsorption & its mechanisms 	Boron	
PY4.3	GIT movements, regulation and functions. Describe defecation				K-KH-Y	<ol style="list-style-type: none"> 1. Physiology of Basal electrical rhythm/slow waves in the GIT <ul style="list-style-type: none"> ○ Intrinsic frequency of slow waves in different regions of the gut 2. Physiology of mastication 	Best & Taylor	BERNE & LEVY BORON

	reflex. Role of dietary fibre.					<p>3. Describe Deglutition and the stages of Deglutition , control of deglutition</p> <p>4. Functions of upper & lower esophageal sphincter</p> <p>5. Esophageal peristalsis</p> <ul style="list-style-type: none"> ○ Primary & secondary peristalsis <p>6. motor functions of proximal stomach</p> <ul style="list-style-type: none"> ○ physiology of accommodation &Receptive relaxation <p>7. motor functions of distal stomach -Grinding & Sieving</p> <p>8. Motor functions of pylorus</p> <p>9. Factors involved in the control of gastric emptying.</p> <p>Movements of small intestine in post meal state</p> <p>1. Propulsive movements</p> <ul style="list-style-type: none"> ○ Peristalsis and physiology of starlings Law of intestine <p>2. Mixing and segmental movements</p> <p>Movements of small intestine in fasting state</p> <p>Physiology ofMigrating motor complex</p>	Best & Taylor	BERNE & LEVY BORON
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						<ol style="list-style-type: none"> 1. Phases of MMC 2. Role of hormones- motilin 3. Functions of MMC 3. Movements of intestinal mucosa and villi 4. Control of small intestinal movements 5. Large intestinal movements – <ul style="list-style-type: none"> ○ Propulsive & Non-propulsive segmentation movements ○ peristaltic & anti-peristaltic movements, Haustrations, colonic mass movement 6. Control of colonic motility 7. Colonic reflexes 8. Defecation reflex <ul style="list-style-type: none"> ○ Anatomical & physiological Factors maintaining normal fecal continence –role of sphincters & anorectal angle ○ Anal sampling mechanism ○ Spinal & supraspinal control of defecation 	<p>BERN E & LEVY</p>	<p>BORON Best & Taylor</p>
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						9. Importance of dietary fibre in health & disease		
PY4.4	Physiology of digestion and absorption of nutrients				K-KH-Y	<ul style="list-style-type: none"> • Luminal digestion & membrane/brush border digestion • Digestion and absorption of carbohydrates <ul style="list-style-type: none"> ○ Luminal digestion & membrane/brush border digestion of carbohydrates ○ Transport mechanisms for absorption- SGLuT & GluT • Digestion and absorption of proteins <ul style="list-style-type: none"> ○ Luminal digestion & membrane/brush border digestion of proteins ○ Absorption of whole protein in neonatal period ○ Apical absorption of dipeptides, tripeptides, & tetrapeptides through H⁺ driven cotransport • Digestion and absorption of lipids <ul style="list-style-type: none"> ○ Role of emulsification & bile acids 	BORO N	BERNE & LEVY Ganong

						<ul style="list-style-type: none"> ○ Role of lipases & colipases ○ Micellar organization for absorption ○ Role of enterocytes, chylomicrons & lymphatics for absorption ● Absorption of B12 & iron ● Defects in macronutrient & micronutrient digestion and absorption ● Lactose intolerance 		
PY4.5	Source of GIT hormones , their regulation and functions				K-KH-Y	Source, target cells, receptors, physiological actions & regulation of various GIT hormones-Gastrin, Secretin, Cholecystinin, Somatostatin, motilin, GIP, GLP, VIP, Grehlin, peptide YY	Ganong	Best & Taylor
PY4.6	Gut- Brain axis				K-KH-Y	<ol style="list-style-type: none"> 1. Bidirectional interaction of Gut-Brain Axis 2. Role of enteric nervous system, GIT hormones & immune system 3. Neuroimmune mechanisms- role of mast cells, MALT, GALT 4. Role of enteric microbiota on Gut-brain axis 	BORON	BERNE & LEVY

						<ul style="list-style-type: none"> a. From Gut microbiota to brain b. From brain to gut microbiota <p>5. Role of dietary fibre on microbiota & Gut-brain axis</p>		
PY4.7	Structure and functions of liver & gall bladder				K-KH-Y	<ul style="list-style-type: none"> 1. Functional anatomy of liver and biliary tree 2. Dual blood supply -Interplay of portal circulation & Hepatic circulation 3. Hepatic lobule, portal lobule & portal acinus 4. Zonation in liver – <ul style="list-style-type: none"> ○ Compare & contrast hepocytes in zone I,II&III ○ Functional & clinical importance of zonation 5. Uptake, processing & secretion of compounds by liver 6. Functions of liver 7. Role of Liver as a metabolic and detoxifying organ 8. Functions of gall bladder 9. Control of gall bladder motility 10.Pathophysiology of gall stones 	BORON	BERNE & LEVY Best & Taylor

PY4. 8	Gastric function tests, pancreatic exocrine function tests & liver function tests				K-KH-Y			
PY4. 9	Physiological aspects of peptic ulcer, gastro-oesophageal reflux disease, vomiting, diarrhoea, constipation, adynamic ileus, Hirschsprung's disease				K-KH-Y	Pathophysiology & physiological basis of management in 1. Disorders of deglutition: dysphagia 2. Disorders of esophageal motility a. Achalasia cardia b. Gastroesophageal reflux disease 3. Disorders of gastric secretion & motility a. Peptic ulcers, H. pylori, b. Medical & surgical management of peptic ulcer c. Gastroparesis diabeticorum & its clinical implications d. Zollinger Ellison syndrome	BERN E &LEV Y	BEST &TAYLOR BORON

						<p>4. Disorders of intestinal secretion & motility</p> <ol style="list-style-type: none"> a. Diarrhoea b. oral rehydration therapy c. diabetic enteropathy d. adynamic ileus e. hirshprungs disease f. irritable bowel syndrome g. inflammatory bowel disease <p>5. Vomiting</p>		
PY4.10	Demonstrate the clinical examination of the abdomen			DOA P	S-SH-Y	<p>Student should be able to examine correctly the Nine regions of the abdomen in the following aspects:</p> <ol style="list-style-type: none"> 1. Inspection of abdomen 2. Light & deep palpation 3. Palpation of Spleen 4. Palpation of Liver 5. Palpation of Kidney 6. Percussion of abdomen 	Bates guide to physical examination	

CARDIOVASCULAR PHYSIOLOGY

Comp . No.	COMPETENCY	LECT URE No. Of HOURS	PRAC/SGD/ Tut/ Int hrs	SDL hrs	DOMAIN-LEVEL-CORE	OBJECTIVES	BASE BOOK	REFEREN CE BOOK
PY5.1	Functional anatomy of heart,				K-KH-Y	<p>Five cardiac subsystems:</p> <ol style="list-style-type: none"> 1. Electrical pacemaker and conduction system of heart 	Best & Taylor	Boron and Boulpaep &

	pacemaker tissues and conduction system					<ol style="list-style-type: none"> 2. Heart muscle: functional relevance of wall thickness of different chambers and direction of cardiac muscle fibres 3. Valves of heart 4. Functional anatomy of Coronary circulation 5. Autonomic innervations of different chambers of heart and its relevance <p>Vascular tree</p> <ol style="list-style-type: none"> a. Various types of blood vessels, histology & structure- function relationships b. Series & parallel arrangement of vascular elements c. Low pressure vs high pressure circulation d. Systemic vs pulmonary circulation 		
PY5.4	Generation and conduction of cardiac impulse				K-KH-Y	<ol style="list-style-type: none"> 1. Usual pacemakers & latent pacemakers- hierarchical pacemaker systems 2. Molecular physiology of pacemaker activity & genesis of pacemaker potential <ol style="list-style-type: none"> a. Role of Ca²⁺ oscillations b. kinetics of voltage gated ion channels, c. funny current, HCN channels(Hyperpolarization 	Boron and Boulp aep &	Berne & levy Physiology Best & Taylor

						<p>activated Cyclic Nucleotide gated channels), T-type Ca²⁺ channels,</p> <p>d. NCX (sodium calcium exchanger)</p> <ol style="list-style-type: none"> 3. Different phases of action potential in pacemaker cells 4. Properties of action potential in different regions of heart and molecular basis of their differences 5. Neurohumoral modulation of pacemaker activity, vagal tone, overdrive suppression, decremental conduction 6. Normal mode of impulse propagation in heart & temporal order of spread of depolarization, repolarization in heart 7. Conduction velocity & conduction blocks 		
PY5.2	Properties of cardiac muscle-morphology, electrical, mechanical and metabolic functions				K-KH-Y	<p>Morphological properties:</p> <ol style="list-style-type: none"> 1. Structure of cardiomyocyte, intercalated discs for force transmission and impulse spread, gap junctions <p>Electrical properties:</p> <ol style="list-style-type: none"> 2. Autorhythmicity & Hierarchical pacemaker systems, unique features of cardiac excitation-contraction coupling, calcium induced calcium release(CICR), 	Best & Taylor	Boron and Boulpaep & Guyton

						<p>long refractory period, reasons for absence of tetanus and fatigue in cardiac muscle</p> <p>Mechanical properties:</p> <ol style="list-style-type: none"> 3. Isometric length-tension relation in heart- operating point of cardiac muscle on ascending part, resting length of 1.6um in cardiac sarcomere, force-velocity relationship, pre-load, afterload, inotropic state, force-frequency relationship – bowditch effect/stair case effect, frank-starling law <p>Metabolic properties:</p> <ol style="list-style-type: none"> 4. Predominantly aerobic metabolism, wide spectrum of energy sources – fatty acids (predominantly), rich in mitochondria, high O2 extraction ratio, lack of O2 debt, 5. determinants of Myocardial O2 consumption- heart rate, wall tension/systolic pressure, extent of shortening, inotropic state, tension-time index, rate-pressure product, pressure-volume area 		
PY5.3	Events occurring during the cardiac cycle				K-KH-Y	<ol style="list-style-type: none"> 1. Sequence of electrical events 2. Sequence of Mechanical events <ol style="list-style-type: none"> a. Heart as a demand pump b. systole & diastole c. Phases of cardiac cycle- period of rapid filling, 	Guyton	<p>Boron and Boulpaep &</p> <p>Best & Taylor</p>

						<p>diastasis, atrial contraction, isovolumetric contraction, ejection, isovolumetric relaxation</p> <ol style="list-style-type: none"> 3. Wiggers diagram-correlation of electrical and mechanical events during cardiac cycle 4. Pressure-volume changes in each heart chamber during cardiac cycle 5. Phonocardiogram and four heart sounds, <ol style="list-style-type: none"> a. Biophysics of genesis of heart sounds & their correspondence with mechanical events b. Valvular disorders- stenosis & regurgitation c. Biophysics of genesis of murmurs 6. Differences in mechanical events of left heart and right heart, correlation of cardiac cycle with pressure waves in aorta and other blood vessels. 		
PY5.5	Physiology of ECG, application, cardiac axis				K-KH-Y	<ol style="list-style-type: none"> 1. ECG – scalar record of electrical activity from surface of body, volume conduction 2. Normal ECG waves and their source of origin, genesis of normal ECG waves 3. Frontal plane electrocardiogram, Transverse plane 	Boron and Boulp aep &	Best & Taylor

						<p>electrocardiogram, 12-lead ECG, construction of limb leads, augmented unipolar leads, precordial leads, einthovens triangle & law, Wilsons central terminal & goldbergers terminal, normal ECG waveform in each lead of 12-lead ECG</p> <p>4. Vector analysis of ECG-Cardiac dipole vector, lead vector, Hexaxial reference system, vector loop- initial vector, mean vector, terminal vector, mean QRS vector, cardiac axis, explain ECG waveform in each of the 12-leads using vector concepts.</p> <p>5. His-bundle electrocardiogram, vector cardiography</p>		
PY5.6	Abnormal ECG, arrhythmias, heart block & myocardial infarction				K-KH-Y	<p>Pathophysiology of abnormal ECG :</p> <p>1. Ischemia & infarction</p> <p>a. systolic & diastolic current of injury, ST-segment elevation & depression, Q-waves, T-wave inversion,STEMI & non-STEMI, ECG changes in anterior wall Myocardial infarction, posterior wall Myocardial infarction, inferior wall Myocardial infarction, ECG changes in Angina pectoris</p>	Best & Taylor	<p>Boron and Boulpaep &</p> <p>Berne & levy Physiology</p> <p>Ary Goldberger clinical electrocardiography</p>

						<ol style="list-style-type: none"> 2. ECG changes in electrolyte disorders- hyperkalemia, hypokalemia. 3. ECG changes in Right & left ventricular hypertrophy, bundle branch block, 1st degree, 2nd degree & 3rd degree AV block, wenkebach phenomenon and mobitz block 4. Mechanisms of arrhythmias, ECG changes in atrial fibrillation & flutter wolf-parkinson-white syndrome, ventricular tachycardia, ventricular fibrillation 		<p>Braunwald ECG</p> <p>GUYTON</p>
PY5.7	Hemodynamics of circulatory system				K-KH-Y	<ol style="list-style-type: none"> 1. Poiseuille-hagen equation and its limitations, 2. determinants of peripheral vascular resistance-radius of blood vessel, laminar flow vs turbulent flow, Reynolds number, Viscosity of blood and its determinants- hematocrit, shear rate, fahreus-lindquist effect, Newtonian vs non-newtonian fluid properties of blood 3. Bernoulli's principle and its applications, principle of siphon, vascular resistance vs impedance, windkessel effect, resistance vessels vs capacitance vessels, pressure wave vs flow wave, volume pulse wave & pressure pulse wave velocity, critical closing pressure 	Best & Taylor	Boron and Boulpaep &

						<p>and closing volumes, mean circulatory filling pressures, central aortic pressure</p> <ol style="list-style-type: none"> 4. Applications of laplace law in cardiovascular system 5. implications of parallel and series arrangement of vascular elements. 		
PY5.8	Local and systemic cardiovascular regulatory mechanisms				K-KH-Y	<p>Local and systemic control of peripheral vascular system.</p> <ol style="list-style-type: none"> 1. Autoregulatory mechanisms: myogenic, metabolic, tissue pressure and flow-dependant vasodilation. 2. Neuro-humoral control of peripheral circulation <ol style="list-style-type: none"> a. Vaso-constrictor (sympathetic) innervations and vasodilator fibres(sympathetic vasodilator & parasympathetic vasodilator) b. Adrenal medullary hormones & adrenoreceptors in vascular smooth muscle 	Best & Taylor	Boron & Boulpaep

						3. Nitric oxide, eNOS, endothelins, prostaglandins, local metabolites		
PY5.9	Factors affecting heart rate, regulation of cardiac output & Blood pressure				K-KH-Y	<p>Heart rate</p> <ol style="list-style-type: none"> 1. Sympathetic & parasympathetic control, adrenal medullary hormones, marey's Law and its exceptions, clinical applications of marey's law, Bainbridge reflex, cushing's reflex, 2. Concept of HRV (heart rate variability) & its physiological importance <ol style="list-style-type: none"> 1. Study of HRV in time & frequency domain 2. effect of respiration on heart rate- RSA (respiratory sinus arrhythmia) and its clinical importance <p>Regulation of cardiac output</p> <ol style="list-style-type: none"> 1. definition & normal values, cardiac index 2. measurement of cardiac output <ol style="list-style-type: none"> a. fick's principle & various methods of cardiac output measurement 3. Determinants of cardiac output: <ol style="list-style-type: none"> i. Venous return : peripheral venous 	Best & Taylor	Boron & boupaep
							Best & Taylor	Boron & boupaep ,GUYTON

						<p>pumps, venomotor tone, blood volume neurohumoral control of</p> <ol style="list-style-type: none"> ii. peripheral vascular resistance: iii. contractility , iv. heart rate, <ol style="list-style-type: none"> 4. interplay of venous return curve and cardiac output curve-Guytons analysis, effect of arteriolar tone, blood volume, contractility, resistance to venous return 5. integrated cardiac output responses to postural change, valsalva maneuver ,exercise 6. P-V loops, end-systolic pressure volume relationship,effect of changes in preload, afterload, contractility <ol style="list-style-type: none"> 3. Regulation of Blood pressure <ol style="list-style-type: none"> 1. Definition of blood pressure, different types of blood pressures: systolic & diastolic blood pressure, mean arterial pressure, pulse pressure & their normal ranges 2. Three different pressures in circulation- driving 	<p>Boron & Boulpaep</p>	<p>Best & Taylor, GUYTON</p>
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						<p>pressure, transmural pressure, hydrostatic pressure, origins of pressure in circulation-gravity & hydrostatic pressure, compliance of vessel, viscous resistance, inertia of blood & blood vessels(Bernoulli effect)</p> <p>3. Determinants of systolic(contractility of heart & aortic compliance), diastolic(windkessel effect,peripheral vascular resistance), mean arterial pressure & pulse pressure.</p> <p>Short term/neural regulation</p> <ul style="list-style-type: none"> i. High pressure and low pressure Baroreceptors, afferent pathways ii. medullary cardiovascular centres iii. efferent pathways, effectors: sympathetic & parasympathetic control of heart & blood vessels, adrenal medullary hormones & their 		
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						<p>receptors, role of chemoreceptors</p> <p>iv. Features of neural regulation</p> <ol style="list-style-type: none"> 1. Quick reponse 2. finite gain 3. incomplete correction 4. resetting of baroreceptor tone <p>Intermediate & long-term regulation of blood pressure</p> <p>v. Rennin-angiotensin mechanism</p> <p>vi. Renal control of extracellular fluid volume, pressure natriureis & diuresis</p> <p>4. Pathophysiology of Hypertension</p> <ol style="list-style-type: none"> i. New ACC/AHA/ASA-2017 guidelines for elevated blood pressure & Hypertension ii. Essential hypertension, secondary hypertension iii. Physiological basis of management 		
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						5. Hypotension- postural hypotension		
PY5.10	Regional circulations including microcirculation , lymphatic circulation, coronary, cerebral, capillary, skin, fetal, pulmonary & splanchnic circulation.				K-KH-Y	<p>Microcirculation:</p> <ol style="list-style-type: none"> 1. Define microcirculation, regulation of microcirculation- interplay of precapillary & post-capillary resistance, capillary recruitment, vasomotion, role of tissue metabolites and products of healthy endothelium, 2. types of capillaries , starling's principle & four starling's forces for capillary exchange of water, starlings forces in various capillary beds- renal, extrarenal- skeletal muscle, lungs, intestine, 3. pathophysiology of edema, edema safety factor. <p>Lymphatic circulation</p> <ol style="list-style-type: none"> 1. Need for lymphatics <ol style="list-style-type: none"> a. Return of extravasated proteins & cells b. Adaptive immunity c. Absorption of products of lipid digestion a. structure –function relationships of lymphatic system & lymph nodes b. forces&mechanisms for lymph flow in initial 	Boron & boupaep	Best & Taylor
							Best & Taylor	Boron & boupaep

						<p>lymphatics, collecting lymphatics, lymphatic loop, role of valves</p> <p>4. Functional anatomy, percentage of cardiac output at rest, regulation & Unique features of</p> <ol style="list-style-type: none"> a. Coronary circulation: diastolic flow in left ventricle & systolic flow in right ventricle, determinants of coronary blood flow- metabolic control, coronary perfusion pressure, systolic compression, neurohumoral control, coronary vasodilator reserve – importance of systolic pressure time index & diastolic pressure time index, coronary artery disease b. cerebral circulation c. skin circulation d. pulmonary circulation e. splanchnic circulation. <p>5. Fetal circulation</p>		
PY5. 11	Pathophysiology of shock, syncope and heart failure				K-KH-Y	<p>Syncope</p> <ol style="list-style-type: none"> 1. Neurocardiogenic syncope, carotid sinus hypersensitivity, cardiovascular(arrhythmias) & cerebrovascular disorders, postural hypotension & syncope, situational syncope 	GUYTON	HARRISON principles of internal medicine

						<p>Shock</p> <p>2. Definition, Types of shock, pathophysiology & stages of shock, clinical features and management of shock</p> <p>Heart failure</p> <p>3. Clinical physiology of</p> <ol style="list-style-type: none"> a. Systolic & diastolic dysfunction, low output failure & high out failure, right sided vs left sided failure ,forward vs backward failure b. Acute left ventricular failure, CCF/CHF, Cor pulmonale c. causes of heart failure, biochemical & physiological markers of heart failure, d. ejection fraction & its importance e. laplace law & heart failure, f. natural history & clinical features of heart failure, clinical physiology of management. 		Best & Taylor
PY5.12	Recording of blood pressure & pulse at rest and in different grades of			DOA P	S-SH-Y	<p>The student should know:</p> <ol style="list-style-type: none"> 1. Subject preparation & posture, choice of proper size of cuff in relation to arm dimensions, body position & arm position, cuff 	AHA scientific statement:	Sapiras art & science of bedside diagnosis

	exercises & postures					<p>placement in relation to centre of inflatable portion of cuff & surface marking of brachial artery and distance from cubital fossa, tightness of cuff, inflation/deflation system</p> <ol style="list-style-type: none"> 2. The student should be able to record blood pressure by palpatory and auscultatory methods correctly 3. The student should be able to explain auscultatory gap and its importance <p>The student should be able to demonstrate the Effect of posture on blood pressure and pulse rate</p> <p>The student should be able to demonstrate the Effect of different intensities of exercise-mild, moderate, heavy on blood pressure and pulse rate</p>	<p>Recommendations for Blood Pressure Measurement in Humans and Experimental Animals</p> <p>Part 1: Blood Pressure Measurement in Humans-2005</p> <p>C.L.Ghai</p>	<p>C.L.Ghai</p> <p>Exercise physiology for health, fitness & performance by plowman & smith</p> <p>Exercise physiology for health, fitness & performance by plowman & smith</p>
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							A.K.Jain	
PY5.13	Record and interpret normal ECG			DOAP	S-SH-Y K-KH-Y	<ol style="list-style-type: none"> The student should be able to record 12-lead ECG accurately The student should know <ol style="list-style-type: none"> Dimensions of ECG graph paper, its voltage and time calibration, recording speed Estimation of heart rate, duration of P , QRS Complex, T waves, PR interval, QT, QTc interval, their normal values , identification of J-point & ST segment, normal septal q waves, normal R-wave progression, transition point, rS to qR transition, Mean axis in frontal plane and assessment of normal sinus rhythm in the given ECG 	Hampton ECG made easy	Ary Goldberger clinical electrocardiography Boron & Boulpaep
PY5.14	Cardiovascular autonomic function tests			DEMONSTRATION	S-SH-N	<p>The student should know</p> <ol style="list-style-type: none"> Heart rate variability (HRV)- LF, HF, LF/HF, RMSSD, Poincare plot-physiological significance of these parameters Deep breathing- E:I Ratio 	Methods of evaluation of autonomic nervous	Comprehensive electrocardiology by Peter McFarlane

						<ol style="list-style-type: none"> 3. Valsalva manoeuvre: valsalva ratio 4. Active standing test, Head up tilt 5. Sudomotor function: Galvanic skin reponse 6. Ewings battery of tests 	<p>s syste m Functi on: Zygmu nt & Stancz yk A</p>	
PY5. 15	Clinical examination of cardiovascular system			DEMONSTRATION	K-KH-Y	<ol style="list-style-type: none"> 1. Student should learn the proper technique, necessary postural adjustments & manoeuvres, relevant surface anatomical landmarks, instructions to be given to the subject, expected observations in a normal subject, methodical recording and interpretation of observations. 2. Student should be able to examine peripheral vascular system under the following headings <ol style="list-style-type: none"> a. Palpation of peripheral pulses: Radial, brachial, carotid, superficial temporal, femoral, popliteal, posterior tibial, dorsalis pedis, simultaneous palpation of pulses for radio-radial & radio-femoral delay. b. Radial pulse examination: Determination of rate, 	<p>Bates guide to physic al exami nation</p> <p>C.L.G hai</p>	Sapiras art & science of bedside diagnosis
				DOAP	S-SH-Y			

						<p>rhythm & character, volume, condition of vessel wall</p> <p>c. Carotid pulse examination: amplitude, contour of pulse wave-speed of upstroke, duration of summit, speed of downstroke, variation in amplitude: beat-to-beat & Respiration</p> <p>d. Jugular venous pressure:</p> <p>2. The student should be able to :</p> <p>a. inspect: precordium, tracheal position, apical impulse, other pulsations, dilated veins</p> <p>b. palpate: apex beat: proper postural adjustments & manoeuvres for Localization, diameter, amplitude & duration, tracheal position, parasternal heave, direction of flow of veins, thrills</p> <p>c. percuss heart borders</p> <p>d. auscultate heart sounds: identification of S1&S2 in all areas, comparison of their intensity, timing in relation to carotid pulse, split of second heart sound</p>		
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PY5. 16	Arterial pulse tracing using finger plethysmography			DEMONSTRATION	S-SH-N	1. components of normal pulse, tidal wave & percussion wave, reflected waves, dicrotic notch, systolic shoulder, upstroke, summit & downstroke, effect of location and age on pulse wave form.		McDonald's blood flow in arteries
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Respiratory System

Comp . No.	COMPETENCY	LECTURE No. Of HOURS	PRAC/SGD/ Tut/ Int hrs	SDL hrs	DOMAIN-LEVEL-CORE	OBJECTIVES	BASE BOOK	REFERENCE BOOK
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PY6.1	Describe the functional anatomy of respiratory tract		Integ (anatomy)		K-KH-Y	<ol style="list-style-type: none"> 1. Structure function relationships of respiratory tract: <ol style="list-style-type: none"> a. Upper airway, conducting zone, respiratory zone b. Anatomical dead space 2. Dual circulations in lung & their physiological importance <ol style="list-style-type: none"> a. Pulmonary circulation- <ol style="list-style-type: none"> i. unique features of pulmonary circulation ii. role of alveolar & extra-alveolar vessels b. Bronchial circulation c. Anatomical shunt d. Pulmonary microcirculation 3. Gaseous laws---Dalton's law of partial pressures, Boyle's law, Charles's law, Henry's law, universal gas equation 4. Control of Breathing– Neural & Chemical regulation 5. Functions of lung <ol style="list-style-type: none"> a. Respiratory functions b. Endocrine & metabolic functions of the lungs 	Berne & Levy	Boron Best & Taylor
PY6.2	Describe the mechanics of normal respiration, pressure changes during				K-KH-Y	<ol style="list-style-type: none"> 1. Mechanics of lung and thoracic cage: <ol style="list-style-type: none"> a. role of respiratory muscles 2. Static properties of lung. <ol style="list-style-type: none"> a. Compliance of lung: static lung compliance 	Berne & Levy	Boron Best & Taylor

	<p>ventilation, lung volume and capacities, alveolar surface tension, compliance, airway resistance, ventilation-perfusion ratio, diffusion capacity of lungs</p>					<ul style="list-style-type: none"> b. Compliance of thoracic cage c. Intrapleural pressure changes in respiration d. Relaxation Pressure-volume curves of the lungs, chest wall & total respiratory system, physiological importance of functional residual capacity e. Factors affecting alveolar stability <ul style="list-style-type: none"> i. Laplace law & surface tension, surfactant, interdependence ii. Pressure-volume curves of air filled & saline filled lungs. <p>3. Dynamic properties of lung.</p> <ul style="list-style-type: none"> a. Patterns of air flow-laminar, turbulent, transitional, Reynolds number in different segments of respiratory tract b. airway resistance- <ul style="list-style-type: none"> i. contribution of different segments of respiratory tract to airway resistance ii. factors that contribute to air way resistance, 		
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						<p>neurohumoral control</p> <p>iii. implications of series & parallel arrangement of airways</p> <p>c. Dynamic compliance, time constant, work of breathing, dynamic air way compression</p> <p>d. Flow-volume curves</p> <p>e. Pathophysiology Restrictive vs obstructive lung disease</p> <p>f. Emphysema & dynamic compression</p> <p>Ventilation-perfusion ratios</p> <p>1. Composition and partial pressures of various gases in atmospheric air, humidified air , expired air, alveolar, arterial blood, venous blood</p> <p>2. Ventilation-</p> <ul style="list-style-type: none"> ○ Physiological & anatomical dead space ○ minute alveolar, dead space & tidal ventilation ○ distribution of ventilation in the lung <p>3. perfusion</p> <ul style="list-style-type: none"> ○ distribution of perfusion in the lung 		
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						<ul style="list-style-type: none"> ○ pulmonary vascular resistance ○ regulation of perfusion <ul style="list-style-type: none"> ▪ physiology of hypoxic vasoconstriction <ol style="list-style-type: none"> 4. ventilation-perfusion ratio <ol style="list-style-type: none"> a. regional variations in ventilation/perfusion ratios & their physiological importance b. alveolar-arterial O₂ difference c. anatomical & physiological shunts 5. diffusion capacity of lung & its abnormalities 		
PY 6.3	Describe and discuss the transport of respiratory gases: Oxygen and Carbon dioxide				K-KH-Y	<p>Physiology of gas exchange:</p> <ol style="list-style-type: none"> 1. Structure function relationships of Respiratory membrane 2. Factors affecting the rate of diffusion at respiratory membrane- fick's law of diffusion 3. perfusion vs diffusion limited process in gas exchange 4. diffusion capacity of the lungs: DL_{co} <p>Physiology of O₂ & CO₂ transport</p> <ol style="list-style-type: none"> 1. O₂ Transport in blood <ol style="list-style-type: none"> a. O₂-Hb dissociation curve: physiological importance of sigmoid curve 	Berne & Levy	Boron Best & Taylor

						<ul style="list-style-type: none"> b. Physiological factors that shift O₂-Hb dissociation curve :pH, CO₂, Temperature, 2,3-BPG, fetal haemoglobin, Carbon monoxide c. Bohr effect <p>2. Processes of CO₂ transport in blood</p> <ul style="list-style-type: none"> a. Dissolved form, Bicarbonate form (Chloride shift) & carbaminohemoglobin b. CO₂ dissociation curve & Haldane effect 		
PY6.4	Describe and discuss the physiology of high altitude and deep sea diving				K-KH-Y	<ul style="list-style-type: none"> 1. Physiology of high altitude <ul style="list-style-type: none"> ○ Effect of low barometric pressure, decreased temperature, Radiation ○ Acclimatization ○ High altitude sickness: <ul style="list-style-type: none"> ○ Acute mountain sickness ○ High altitude cerebral & pulmonary edema 2. Physiology of deep sea diving <ul style="list-style-type: none"> 1. SCUBA, Hazards of deep sea diving, N₂ narcosis 	GUYTON	Boron Best & Taylor

PY6.5	Describe and discuss the principles of artificial respiration, oxygen therapy, acclimatization and decompression sickness		2-Integ(General medicine)		K-KH-Y	<ol style="list-style-type: none"> 1. Artificial respiration: Different methods & modes of mechanical ventilation 2. Oxygen therapy <ol style="list-style-type: none"> a. Uses in different forms of hypoxia b. Effects of 100% O2 therapy <p>Decompression sickness: Mechanism and physiological basis of treatment and prevention</p>	GUYTON	Boron Best & Taylor
PY6.6	Describe and discuss the pathophysiology of dyspnea, hypoxia, cyanosis, asphyxia, drowning, periodic breathing	2			K-KH-Y	<ul style="list-style-type: none"> • Eupnea, apnea, dyspnea, hyperpnea, tachypnea • Pathophysiology of Hypoxia <ol style="list-style-type: none"> a. Types b. Physiological basis of treatment in each type of Hypoxia • Cyanosis- types • Asphyxia- Stages • Drowning • Periodic breathing-types & pathophysiology 	Berne & Levy	Boron Best & Taylor
PY6.7	Describe and discuss lung function tests and their clinical significance				K-KH-Y	<ul style="list-style-type: none"> ▪ Classification of lung function tests ○ Ventilation functions <ul style="list-style-type: none"> ▪ Static & dynamic lung function tests, flow-volume curves 	Berne & Levy	Boron Best & Taylor

						<ul style="list-style-type: none"> ▪ Closing volumes, time constant ▪ Strength of respiratory muscles ▪ Measurement of dead space & shunt ▪ Pattern in Obstructive & restrictive lung disease ○ Perfusion functions: <ul style="list-style-type: none"> ▪ Measurement of pulmonary blood flow ○ Gas exchange <ul style="list-style-type: none"> ▪ Blood gas analysis & pulse oximetry ▪ DLCO ○ Ventilation-perfusion scans • Physiological basis of various tests • Significance of various tests in clinical disorders 		The lung:L.E. Cotes ATS/ERS TASK FORCE: STANDARDIZATION OF LUNG FUNCTION TESTING
PY6.8	Demonstrate the correct technique to perform & interpret Spirometry			DEMONSTRATION	K-KH-Y S-SH-Y	The student should know: Subject preparation & instructions, Postural adjustments for the procedure, Correct technique	ATS/ERS TASK FORCE: STANDARDIZATION OF LUNG	

				DOA P		The student should be able to record vital capacity using spirometer and Calculate vital index	FUNCTI ON TESTIN G	
PY6. 9	Demonstrate the correct clinical examination of the respiratory system in a normal volunteer or simulated environment			DEM ONS TRAT ION DOA P	K-KH-H S-SH-Y	<ol style="list-style-type: none"> 1. The student should know: <ul style="list-style-type: none"> surface anatomical landmarks on the chest relevant to clinical examination of respiratory system, Subject preparation & instructions, Postural adjustments, rules of percussion, nine lung fields*, differences between vesicular and bronchial breath sounds 2. The student should be able to: <ol style="list-style-type: none"> a. inspect: shape & symmetry of chest, tracheal position, apical impulse, respiratory movements b. palpate: tracheal position, apical impulse, respiratory movements, tactile vocal fremitus c. percuss: lung fields, tidal percussion d. auscultate: breath sounds, vocal resonance 	Bates guide to clinical examination	

<p>PY6. 10</p>	<p>Demonstrate the correct technique to perform measurement of peak expiratory flow rate in a normal volunteer or simulated environment</p>			<p>.DEMONSTRATION</p> <p>DOAP</p>	<p>K-KH-Y</p> <p>S-SH-Y</p>	<ol style="list-style-type: none"> 1. The student should know: subject preparation & instructions, Postural adjustments for the procedure and correct technique to measure the peak expiratory flow rate 2. The student should be able to record peak expiratory flow rate correctly 	<p>ATS/ERS TASK FORCE: STANDARDISATION OF LUNG FUNCTION TESTING</p> <p>CL Ghai</p>	
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RENAL PHYSIOLOGY

Comp. no	COMPETENCY	LECTURE.N.O.OF HOURS	PRACTICALS/TUTORIAL NO. OF HOURS/SL	SDL.N O.OF HOURS	DOMAIN-LEVEL-CORE	OBJECTIVES	BASE BOOK	REFERENCE BOOK
PY 7.1	Structure & function of kidney				K-KH-Y	<ol style="list-style-type: none"> 1. Functional anatomy of kidneys 2. Types of nephrons- structure-functions relationships and physiological importance of their relative numbers 3. Structure function relationships of various segments of nephron 4. Innervations & Blood supply to kidney -unique features of renal circulation 5. Functions of kidney <ul style="list-style-type: none"> ○ -excretory & non-excretory functions of kidney 	BERNE & LEVY	BEST AND TAYLOR BORON

PY 7.2	Structure and functions of juxta-glomerular apparatus and role of rennin-angiotensin system				K-KH-Y	<ol style="list-style-type: none"> 1. Structure-function relationships in the juxta glomerular apparatus: <ol style="list-style-type: none"> a. Macula densa b. Extraglomerular mesangial cells c. Granular cells 2. mechanism of Renin – Angiotensin system 3. physiological basis of therapeutic modulation of Renin – Angiotensin system 	BERNE & LEVY	BEST AND TAYLOR BORO N
PY 7.3	Mechanism of urine formation involving processes of filtration, tubular reabsorption & secretion; concentration and diluting mechanisms				K-KH-Y	<ol style="list-style-type: none"> 1. three processes involved in the production of urine and composition of “normal” urine 2. glomerular filtration: <ol style="list-style-type: none"> 1. Structure-function relationships of filtration barrier & slit diaphragms 2. Role of charge & size in determining the filterability of substance 3. Glomerular filtration rate, starlings forces, regulation of GFR <ul style="list-style-type: none"> ▪ Tubule-glomerular feedback and its importance 	BERNE & LEVY	BEST AND TAYLOR BORO N

						<ol style="list-style-type: none"> 4. Role and regulation of renal blood flow- autoregulation 5. Role of selective changes in resistance of afferent arteriole or the efferent arteriole on RBF and GFR 6. Physiological basis of nephritic & nephritic syndrome. 7. Clinical importance of relationship between GFR and plasma creatinine <ol style="list-style-type: none"> 2. Tubular reabsorption & secretion <ol style="list-style-type: none"> 1. Differential permeability of different segments of nephron 2. Solute & water reabsorption mechanisms in different segments of nephron 3. TF/P Ratios along different segments of nephron and its physiological importance 4. Tubular secretion of organic solutes 		
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						<ul style="list-style-type: none"> ▪ Nonionic diffusion/diffusion trapping <ol style="list-style-type: none"> 5. Renal handling of proteins & urea 6. Glomerulotubular balance and its physiological importance 7. Hormonal regulation of NaCl and water reabsorption 8. Aldosterone paradox & aldosterone escape <p>Concentration and diluting mechanisms:</p> <p>Regulation of body fluid osmolality</p> <ol style="list-style-type: none"> 1. Countercurrent multiplication <ul style="list-style-type: none"> a. Role in Generation of medullary gradient b. Prerequisites for Countercurrent multiplication -role of Countercurrent flow, active transport(Na-K-2Cl transporter), differential water permeability in the limbs of loop of henle, scanty 		
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						<p>blood supply to medulla</p> <ol style="list-style-type: none"> 2. Countercurrent exchanger <ul style="list-style-type: none"> Role in maintenance of medullary gradient <ol style="list-style-type: none"> 1. Counter current flow 2. Reversal of fluxes in vasa recta 3. Lag in equilibrium 3. Factors that modulate urinary concentration & dilution ability of kidney, role of urea 4. Osmotic & Non-osmotic control of vasopressin secretion 5. Free water clearance, obligatory urine volume & maximal urine volume <p>Physiological basis of diuretics</p>		
PY 7.4	Significance & implications of renal clearance				K-KH-Y	<ol style="list-style-type: none"> 1. Concept of renal clearance <ul style="list-style-type: none"> ○ Ficks' s principle/law of conservation of mass 2. Clearance of substances that are: <ol style="list-style-type: none"> 1. Only filtered 	BERNE & LEVY	BEST AND TAYLOR

						<ul style="list-style-type: none"> ▪ Measurement of GFR & estimation of GFR <ul style="list-style-type: none"> i. Inulin clearance ii. Calculation of eGFR: various methods 2. Filtered & secreted <ul style="list-style-type: none"> a. creatinine clearance, PAH clearance 3. Filtered & Absorbed <ul style="list-style-type: none"> a. Transport maximum for glucose and renal splay 3. clinical implications of clearance 		BORO N
PY 7.5	Renal regulation of fluid and electrolyte & acid-base balance				K-KH-Y	Regulation of ECF Volume: <ul style="list-style-type: none"> 1. ECF volume regulation by modulating Na⁺ balance vs ECF osmolality regulation by modulation of water balance 2. concept effective circulating volume 	BERNE & LEVY	BORO N BEST AND

<p>PY1.7 & PY 7.5</p>					<p>K-KH-Y</p>	<ol style="list-style-type: none"> 3. volume sensing systems(high pressure& low pressure circulation), volume sensor signals 4. role of rennin-angiotensin-aldosterone system in ECF volume regulation, structure-function relationships of principal cells & ENaC transporter 5. control of NaCl excretion in euvoemia, volume expansion, volume depletion 6. role of natriuretic peptides & vasopressin ECF volume regulation 7. glomerulotubular balance and its physiological importance <p>potassium homeostasis</p> <ol style="list-style-type: none"> 1. renal potassium handling- role of principal & intercalated cells 2. hormonal & non-hormonal regulation of potassium balance <ol style="list-style-type: none"> a. Aldosterone, vasopressin, glucocorticoids b. Tubular flow rate, acid-base homeostasis, Na⁺ load to distal tubule, role of distal tubule transepithelial potential difference in potassium excretion 		<p>TAYLO R</p>
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						<ul style="list-style-type: none">3. Physiological basis of Potassium sparing diuretics4. Clinical physiology of hypokalemia & hyperkalemia <p>Acid-base balance</p> <ul style="list-style-type: none">1. Concept of pH and pH scale: neutral pH at normal body temperature, acidosis, alkalosis2. Daily acid load: volatile & non-volatile acids3. Mechanisms of pH regulation<ul style="list-style-type: none">a. Blood buffer systems:b. Biochemistry of a buffer:<ul style="list-style-type: none">i. Henderson-hasselbalch equation, isohydric principleii. Closed vs open bufferiii. Various buffer systems in various body compartmentsiv. Why HCO₃⁻ buffer system is the most powerful buffer?c. Respiratory regulation: volatile acids<ul style="list-style-type: none">i. Chemoreceptors, relationship between PCO₂ &		
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						<p>alveolar ventilation</p> <p>d. Renal acid-base handling</p> <ul style="list-style-type: none">i. Acid-base transport mechanisms in different segments of nephron and various transporters & pumps involvedii. Urinary buffers, titrable acidityiii. Role of renal ammonia secretion & phosphate in acid excretioniv. Regulation of renal acid secretion<ul style="list-style-type: none">:hormonal and non-hormonal control<ul style="list-style-type: none">1. mineralocorticoids & glucocorticoid2. role of Plasma pH,		
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						<p>PaCO₂, HCO₃⁻- delivery to tubules, ECF Volume changes, potassium homeostasi s, transepithe lial potential difference- interplay of principal & intercalate d cells</p> <p>e. integrated control of acid-base balance- use of pH-HCO₃⁻- nomograms (Davenport diagrams) for the analysis of acid-base physiology in health & disease</p> <p>f. acid-base disorders: clinical physiology of simple and mixed acid base disorders using Davenport diagrams, plasma & urine anion-</p>		
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						<p>gap and its clinical importance</p> <p>g. arterial blood gas analysis: indications, uses & interpretation of ABG.</p>		
<p>PY 7.6 &</p> <p>PY 7.9</p>	<p>Innervations of urinary bladder, physiology of micturition & its abnormalities</p> <p>Cystometry & normal cystometrogram</p>				<p>K-KH-Y</p> <p>K-KH-Y</p>	<ol style="list-style-type: none"> 1. Innervation of bladder 2. Physiology of voiding <ul style="list-style-type: none"> ○ Micturition reflex- spinal & supraspinal control of micturition. ○ Mechanisms of normal continence: <ul style="list-style-type: none"> ▪ Role of intrapelvic portion of urethra & bladder neck ▪ Role of Internal sphincter ▪ External urethra sphincter & supraspinal mechanisms 3. Cystometry & cystometrogram <ul style="list-style-type: none"> ○ Phases of filling ○ Laplace law & Physiology of urinary bladder ○ plasticity of bladder muscle 4. Urodynamic studies 	<p>GANO NG' PHYSIOLOGY</p>	<p>BORO</p> <p>N</p>

						<p>5. Micturition abnormalities: Effect of</p> <ul style="list-style-type: none"> ○ denervation ○ deafferentiation ○ spinal transaction & stroke: spastic neurogenic bladder <p>6. urinary incontinence: urge incontinence, overflow incontinence, stress incontinence</p>		
PY 7.7	Artificial kidney, dialysis & renal transplantation	1			K-KH-Y	<ul style="list-style-type: none"> ● Renal failure <ul style="list-style-type: none"> ○ Pathophysiology of Acute kidney injury (AKI) <ul style="list-style-type: none"> ▪ Prerenal azotemia ▪ Intrinsic renal parenchymal disease ▪ Post-renal obstruction ○ Pathophysiology of Chronic kidney disease (CKD) & End stage renal disease (ESRD) ● Dialysis: <ul style="list-style-type: none"> ○ Types & Indications of Dialysis <ul style="list-style-type: none"> ▪ Hemodialysis: Dialyser, dialysate, blood 	GUYT ONS PHYSI OLOG Y	Harrison's principles of internal medicine

						<ul style="list-style-type: none"> delivery system, dialysis access <ul style="list-style-type: none"> ▪ Peritoneal dialysis ○ Physiological principles of dialysis • Renal Transplantation: indications, tissue typing & clinical immunogenetics (HLA typing), graft rejection & immunosuppressive therapy, Post-transplantation polyuria 		
PY 7.8	Renal function tests				K-KH-Y	<ul style="list-style-type: none"> • Estimation of glomerular filtration • Tests of tubular function <ul style="list-style-type: none"> ○ Water deprivation test ○ Urinary acidification test • Serum markers of renal function: serum creatinine, serum urea/Blood urea nitrogen(BUN) • Urine analysis 		Harper's biochemistry

ENDOCRINE PHYSIOLOGY

Comp. no	COMPETENCY	LECTURE NO. OF HOURS	PRACTICALS/TUTORIAL NO. OF HOURS/SGL	SDL .NO. OF HOURS	DOMAIN-LEVEL-CORE	OBJECTIVES	BASE BOOK	REFERENCE BOOK
PY.8.1	DESCRIBE THE PHYSIOLOGY OF BONE AND CALCIUM METABOLISM				K-KH-Y	Physiology of Bone: 1. Structure-function relationships of bone <ul style="list-style-type: none"> a. Bone cell types & functions b. Osteoid and its role in bone mineralization-role of osteoblast derived proteins 2. Physiology of adult bone remodelling	BERNE & LEVY	BORON BEST & TAYLOR

					K-KH-Y	<ul style="list-style-type: none"> a. Physiology of bone mineralization b. Interplay of osteoblasts & osteoclasts c. Osteocytic osteolysis d. RANK & RANK Ligand interactions and Role of osteoprotegerin in bone homeostasis e. Role of hormones: PTH, Vitamin, calcitonin, glucocorticoids & sex steroid hormones. <p>Physiological regulation of Calcium & Phosphate:</p> <ul style="list-style-type: none"> 1. Crucial role of Calcium & Phosphate in cellular physiology 2. Parathyroid hormone <ul style="list-style-type: none"> a. Structure, Synthesis, & secretion b. Role of CaSR (calcium sensing receptor) c. Physiological actions of PTH 3. Vitamin -D . <ul style="list-style-type: none"> d. Structure, synthesis & release. e. Regulation of 1,25 dihydroxy cholecalciferol formation.-role of PTH 		
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						<ul style="list-style-type: none"> f. Biological effects of 1,25 dihydroxy cholecalciferol. <ol style="list-style-type: none"> 2. Calcitonin <ul style="list-style-type: none"> a. Structure, synthesis & release. b. Regulation of calcitonin release c. Biological effects of calcitonin d. Role of calcitonin in normal human physiology & therapeutic applications. 4. Integrated control of Ca²⁺ & phosphate <ul style="list-style-type: none"> a. Regulation of Ca⁺⁺ & P by small intestine, bone & Kidney b. Regulation of serum phosphate by FGF23 5. Clinical physiology of Hypocalcemia & hypercalcemia 6. Pathophysiology of Rickets, osteomalacia 7. Clinical physiology of osteoporosis & its management 8. hyperparathyroidism, hypoparathyroidism 		
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PY.8.2	SYNTHESIS, SECRETION, TRANSPORT, PHYSIOLOGICAL ACTIONS, REGULATION AND EFFECT OF ALTERED (HYP O & HYPER) SECRETION OF PITUITARY GLAND, THYROID GLAND, PARATHYROID GLAND, ADRENAL GLAND, PANCREAS AND HYPOTHALAMUS				K-KH-Y	<p>HYPOTHALAMUS</p> <ol style="list-style-type: none"> 1. Structure-function relationships of bone 2. structural –function relationships of Hypothalamus 3. functions of parvocellular & magnocellular hypothalamic neurons. 4. hypothalamo-Hypophyseal portal system 5. Hypothalamic releasing and inhibitory hormones <p>Structural –function relationships of pituitary gland</p> <p>Physiology of adenohypophysis:</p> <ol style="list-style-type: none"> 1. Five endocrine cell types & six hormones released by adenohypophysis 2. ACTH: <ol style="list-style-type: none"> a. Structure, Synthesis & release of ACTH b. ACTH receptors c. Regulation of ACTH release d. Hypothalamic control & Circadian pattern of CRH and ACTH secretion e. Physiological actions of ACTH & its role in stress response 3. TSH: <ol style="list-style-type: none"> a. Structure, Synthesis & release of TSH b. TSH receptors 	BERN E & LEVY	BORON BEST & TAYLOR
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						<ul style="list-style-type: none"> c. Regulation of TSH release d. Hypothalamic control & Circadian pattern of TRH and TSH secretion e. Physiological actions of TSH f. <p>4. FSH & LH</p> <ul style="list-style-type: none"> a. Structure, Synthesis & release of FSH and LH b. FSH & LH receptors c. Regulation of FSH & LH release d. Physiological actions of FSH & LH e. Role of pulsatile GnRH secretion on <ul style="list-style-type: none"> i. Gonadotrope & gonadal function ii. Onset of puberty iii. Role of Frequency of GnRH pulses on regulation of FSH & LH release iv. Clinical implications of GnRH pulsatility <p>5. Growth hormone</p> <ul style="list-style-type: none"> a. Structure, Synthesis & release of GH b. GH receptors, Somatomedin hypothesis c. Regulation of GH release d. Sleep-wakefulness entrainment of GH 		
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						<ul style="list-style-type: none"> e. Physiological actions of GH, Somatomedin hypothesis- Insulin like growth factors, Role in stress response f. Clinical physiology of growth hormone excess & deficiency before & after epiphyseal fusion g. Psychosocial dwarfism <p>6. PROLACTIN</p> <ul style="list-style-type: none"> a. Structure, Synthesis & release of Prolactin b. Prolactin receptors c. Regulation of prolactin release: role of negative regulation by dopamine d. Physiological actions of prolactin e. Sleep related Prolactin secretion f. Neuro-endocrine reflex g. Clinical physiology of therapeutic lactation suppression <p>Physiology of neurohypophysis</p> <ul style="list-style-type: none"> a. Structure, Synthesis & release of Oxytocin and vasopressin b. Role of magnocellular hypothalamic neurons c. Oxytocin and vasopressin receptors <p>VASOPRESSIN</p>		
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						<ul style="list-style-type: none"> a. Regulation of vasopressin release b. Osmotic & non-osmotic stimuli c. Osmoregulatory set point d. Regulation of thirst e. Physiological actions of vasopressin. f. Diabetes insipidus & Syndrome of inappropriate diuretic hormone secretion <p>OXYTOCIN</p> <ul style="list-style-type: none"> a. Regulation of Oxytocin release b. Physiological actions of oxytocin-milk ejection reflex c. Clinical applications of oxytocin <ul style="list-style-type: none"> 7. Primary, secondary & tertiary endocrine disorders 8. Clinical physiology of hypophysectomy, stalk section , sheehans syndrome, craniopharyngioma 		
						<p>THYROID</p> <ul style="list-style-type: none"> 1. Structure ,synthesis <p>Secretion of thyroid hormones</p>	<p>BERN E & LEVY</p>	<p>BORON</p>

					K-KH-Y	<ol style="list-style-type: none"> 2. Iodine uptake & iodine salvage mechanisms 3. Hypothalamo –pituitary- thyroid axis 4. Thyroid hormone receptors & Mechanism of action 5. Biphasic effect of iodine on thyroid hormone synthesis- Wolf-chaikoff effect & Autoregulation <ol style="list-style-type: none"> a. Physiological importance and clinical applications of Wolf-chaikoff effect 6. Plasma transport of thyroid hormones & clinic- physiological importance of plasma protein binding 7. physiological effects of thyroid hormones 8. Role of thyroid on development of CNS 9. Clinical physiology Hypothyroidism & hyperthyroidism 10. congenital hypothyroidism 11. Benefits and risks of iodine supplementation of common salt 		BEST & TAYLOR
					K-KH-Y	PARATHYROID REFER TO PY8.1	BERN E & LEVY	BORON BEST & TAYLOR
					K-KH-Y	ADRENAL GLAND	BERN E & LEVY	BORON

					<p>Structure –function relationships of adrenal cortex & medulla</p> <ol style="list-style-type: none"> 1. Structure, synthesis & release of adrenocortical hormones 2. Metabolism of adrenocortical hormones 3. Hypo-thalamo-pituitary-adrenal axis <p>Glucocorticoids</p> <ol style="list-style-type: none"> 1. Glucocorticoid receptors & mechanism of action 2. Circadian pattern 3. Physiological actions of Glucocorticoids 4. Permissive action of glucocorticoids 5. Anti-inflammatory and immunomodulatory action of glucocorticoids. 6. Glucocorticoid action on mineralocorticoid sensitive tissues 7. Role in stress response 8. Clinical applications of glucocorticoids 9. Clinical physiology Cushing syndrome & addisons disease <p>Mineralocorticoids</p> <ol style="list-style-type: none"> 1. Mineralocorticoid receptors & mechanism of action 	BEST & TAYLOR
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						<ol style="list-style-type: none"> 2. Renin angiotensin aldosterone system & Role of serum K⁺ in regulation of release 3. Physiological effects of mineralocorticoids 4. Primary mineralocorticoid excess <p>Adrenal medulla</p> <ol style="list-style-type: none"> 1. Structure, synthesis and release and metabolism of adrenal medullary hormones/catecholamines 2. Adrenomedullary receptors- alpha & beta and mechanism of actions 3. Regulation of catecholamines 4. physiological effects of Adrenomedullary catecholamines 5. clinical physiology of adrenoceptor modulation 6. Pheochromocytoma 		
					K-KH-Y	<p>Pancreatic endocrine cells and their hormonal products</p> <p>Insulin</p> <ol style="list-style-type: none"> 1. Structure, synthesis, release and metabolism of insulin 2. coupling of beta cell glucose metabolism to insulin release 3. effect of neurohumoral modulation, exercise & feeding on insulin release 	BERN E & LEVY	BORON BEST & TAYLOR

						<ol style="list-style-type: none">4. C-peptide: equimolar relationship to insulin & its clinical importance5. phases of insulin release6. incretins & incretin effect7. insulin receptor & mechanism of action8. spare receptors, hyperinsulinemia& receptor downregulation9. Physiological actions of insulin10. types & pathophysiology of diabetes mellitus,11. hypoglycemia12. clinical physiology of hypoglycemic drugs <p>Glucagon</p> <ol style="list-style-type: none">1. Structure, synthesis, release and metabolism of glucagon2. regulation of glucagon release3. Physiological actions of Glucagon4. physiological importance of insulin-glucagon ratio5. insulin counter regulatory hormones		
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P.Y.8. 3	FUNCTIONS OF THYMUS & PINEAL GLAND				K-KH-Y	<p>1. Structure and functions of thymus gland</p> <p>CIRCADIAN RHYTHMS</p> <ol style="list-style-type: none"> 1. Role of suprachiasmatic nucleus of hypothalamus 2. melanopsin positive retinal ganglion cell-retinohypothalamic tract-suprachiasmatic nucleus pathway for circadian control 3. melatonin & circadian rhythms <ol style="list-style-type: none"> 1. noradrenergic innervation of pineal gland 2. suprachiasmatic nucleus control of melatonin secretion 3. melatonin receptors 4. physiological actions of melatonin 4. source & effect of blue wavelength light in altering circadian rhythms & melatonin secretion 5. clinical physiology of jet lag, insomnia & circadian sleep disorders 	GANO NG PHYSI OLOG Y	
P.Y.8. 4	FUNCTION TESTS						BORO N	ENDOCRIN E PHYSIOLO

	<p>THYROID GLAND,ADRENAL CORTEX,ADRENAL MEDULLA & PANCREAS</p>					<p>1. Measurement of hormone concentration in the blood: immune assay</p> <ul style="list-style-type: none"> i. Radioimmuno assay ii. Chemiluminiscence immuno assay <p>Dynamic measurements of hormone secretion</p> <ul style="list-style-type: none"> i. stimulation tests ii. suppression tests <p>Interpretation of thyroid function tests</p>		<p>GY by P.MOLINA</p>
<p>P.Y.8. 5</p>	<p>METABOLIC & ENDOCRINE CONSEQUENCES OF OBESITY & METABOLIC SYNDROME,STRESS RESPONSE, OUTLINE THE PSYCHIATRY COMPONENT PERTAINING TO METABOLIC SYNDROME</p>				<p>K-KH-Y</p>	<p>Causes and features of metabolic syndrome & obesity:</p> <ul style="list-style-type: none"> 1. physiological regulation of energy balance 2. role of hypothalamus 3. role of adipokines 4. definition of obesity 5. pathophysiology of obesity & physiological basis of management <p>Metabolic syndrome</p> <ul style="list-style-type: none"> 6. definition of metabolic syndrome 	<p>BORON PHYSIOLOGY</p>	

PY.8.6	DESCRIBE & DIFFERENTIATE THE MECHANISM OF ACTION OF STEROID, PROTEIN & AMINE HORMONES.				K-KH-Y	<p>Principles of endocrine function</p> <ol style="list-style-type: none"> 1. Chemical signalling pathways- endocrine, paracrine, autocrine 2. Classification of hormones & receptors <ul style="list-style-type: none"> -peptide, steroid & amino acid derivative hormones -membrane, cytoplasmic & nuclear receptors <ul style="list-style-type: none"> -Membrane receptors – upregulation and downregulation (desensitization) -Signal transduction mechanisms -Second messenger system, Signal amplification -Permissive actions of hormones 3. Physiological importance of free & bound forms of hormones 4. Negative feedback control <ol style="list-style-type: none"> a. Simple & hierarchical feedback loops b. Set point c. Pulsatile release of hormones <ol style="list-style-type: none"> i. Physiological role and clinical applications ii. Circadian rhythms of hormones <p>Hormones as allosteric effectors</p>	BORO N	BERNE & LEVY
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REPRODUCTIVE PHYSIOLOGY

Comp.no	COMPETENCY	LECTURE. NO.OF HOURS	PRACTICALS/TUTORIAL NO. OF HOURS /SGL	SDL.NO OF HOURS	DOMAIN-LEVEL-CORE	OBJECTIVES	BASE BOOK	REFERENCE BOOK
PY.9.1	SEX DETERMINATION,SEX DIFFERENTIATION AND THEIR ABNORMALITIES AND OUTLINE PSYCHIATRY AND				K-KH-Y	<ol style="list-style-type: none"> 1. Intro to reproductive system – 2. Differentiation of gonads and the role of SRY gene on Y- chromosome 3. Differentiation of internal genital ducts 4. Differentiation of external genitalia 	BORON	BERNE & LEVY GUYTON WILLIAM'S OBSTETRICS

	PRACTICAL IMPLICATION OF SEX DETERMINATION					<ul style="list-style-type: none"> 5. Endocrine & paracrine control mechanism in sexual differentiation <ul style="list-style-type: none"> a. Role of anti-mullerian hormone, testosterone, dihydrotestosterone 6. Disorders of sexual development 		
PY9.2	PUBERTY, ONSET, PROGRESSION, STAGES-EARLY AND DELAYED PUBERTY AND OUTLINE ADOLESCENT CLINICAL AND PSYCHOLOGICAL ASSOCIATION				K-KH-Y	<ul style="list-style-type: none"> 1. Hypothalamo pituitary gonadal axis 2. Physiology of onset of puberty <ul style="list-style-type: none"> a. Define puberty, Pubarche, menarche, thelarche, adrenarche b. Role of GnRH pulsatility, kisspeptin hypothesis c. Regulation of timing of puberty d. Hormonal changes at puberty 4. Tanners stages of puberty in males & females 5. Physical changes during puberty 6. Pathophysiology of precocious puberty & delayed puberty 	GANONG Physiology	<p>BORON Endocrine & Reproductive Physiology by Bruce A White</p> <p>BERNE & LEVY WILLIAM'S OBSTETRICS</p>

PY 9.3	MALE REPRODUCTIVE SYSTEM, FUNCTIONS OF TESTIS AND CONTROL OF SPERMATOGENESIS & FACTORS MODIFYING IT AND OUTLINE ITS ASSOCIATION WITH PSYCHIATRIC ILLNESS				K-KH-Y	<ol style="list-style-type: none"> 1. Functional anatomy of male reproductive system Physiology of sertoli & leydig cells b. Sertoli cell & leydig cell crosstalk in spermatogenesis & androgen synthesis 2. Sertoli cells: <ol style="list-style-type: none"> a. Receptors on sertoli cells b. Products of sertoli cells c. Physiology of inhibins d. Functions of sertoli cells & their products e. Blood testis barrier 3. Leydig cells: <ol style="list-style-type: none"> a. Receptors on leydig cells b. Products of leydig cells c. Synthesis, release & regulation of androgens d. Functions of leydig cells & their products 	BERNE & LEVY	GANONG Physiology BORON, WILLIAM'S OBSTETRICS
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						<ol style="list-style-type: none"> 4. Physiology of Spermatogenesis & its regulation, effect of temperature 5. Accessory sex glands & their secretion 6. Composition of semen, functions of its various constituents, clinical importance of prostate specific antigen (PSA) 7. Spermatozoa maturation, acquisition of motility, Sperm transport, physiology of capacitation 8. Hypothalamo-pituitary-testicular axis 9. Physiology of erection, emission & ejaculation 10. Abnormalities of testicular function 		
PY 9.4	FEMALE REPRODUCTIVE SYSTEM, (A) FUNCTIONS OF OVARY AND ITS CONTROL, (B) MENSTRUAL CYCLE- HORMONAL, U				K-KH-Y	<ol style="list-style-type: none"> 1. Functional anatomy of female reproductive system 2. Hypothalamo-pituitary-ovarian axis 3. Cyclical regulation of female reproductive function <ol style="list-style-type: none"> a. ovarian cycle- follicular & luteal phases 	BERNE & LEVY	GANONG Physiology BORON, WILLIAM'S OBSTETRICS

	<p>TERINE & OVARIAN CHANGES</p>					<ul style="list-style-type: none"> b. menstrual cycle- menstrual, proliferative & secretory phases 4. Growth, development & function of ovarian follicle <ul style="list-style-type: none"> a. Follicle selection & dominant follicle b. Oogenesis & Oocyte maturation c. Hormonal regulation d. Tests for ovulation 5. Theca cell & granulosa cell cross talk <ul style="list-style-type: none"> a. LH & FSH receptors & endocrine functions of thecal cells & granulosa cells b. Two cell, two- gonadotropin model of steroidogenesis c. Physiology of activins & inhibins 6. Endocrine signaling leading to the ovulation of a dominant follicle at the end of the follicular phase <ul style="list-style-type: none"> a. Role of Change in the pattern of GnRH pulsatility b. Physiology of LH surge 		
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						<ul style="list-style-type: none"> c. Positive & negative feedback mechanisms in hypothalamo-pituitary-ovarian axis 7. Endocrine signaling during the luteal phase of a non-pregnant menstrual cycle <ul style="list-style-type: none"> a. Physiology of corpus luteum & luteolysis 8. Hormonal changes in different phases of menstrual cycle and their physiological consequences <ul style="list-style-type: none"> a. Changes in endometrium, cervix & vagina b. Decidual reaction 		
P.Y.9.5	PHYSIOLOGICAL EFFECTS OF SEX HORMONES				K-KH-Y	<p>Mechanism of action, physiological effects & functions of Sex hormones</p> <ul style="list-style-type: none"> 1. Androgens: <ul style="list-style-type: none"> a. Testicular & adrenal androgens a. Androgen receptors & physiological actions of androgens 	GANONG Physiology	BERNE & LEVY BORON, WILLIAM'S OBSTETRICS

						<ul style="list-style-type: none">b. Physiological actions of Testosterone vs dihydrotestosteronec. Role of androgens in development of secondary sexual characteristicsd. Anabolic actions & clinical implications <p>2. Estrogens & progestogens</p> <ul style="list-style-type: none">a. Types of estrogensb. Physiological & clinical importance of aromatase enzymec. Receptors & physiological actionsd. Clinical importance of measurement & modulation of estrogen receptors		
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						e. Testicular estrogens & their physiological actions		
P.Y.9.6	CONTRACEPTIVE METHOD FOR MALE & FEMALE.THEIR ADVANTAGES & DISADVANTAGES				K-KH-Y	Types & mechanisms 1. Temporary contraceptive methods in males 2. Temporary contraceptive methods in females a. Mechanism of action of oral contraceptive pills b. Benefits & risks of OC pills 3. Intrauterine contraceptive devices a. Types/generations b. Mechanism of action IUCD c. Advantages and disadvantages of IUCD 4. Permanent contraceptive methods in males 5. Permanent contraceptive methods in females	BERNE & LEVY	GANONG Physiology BORON, WILLIAM'S OBSTETRICS
P.Y.9.7	EFFECTS OF REMOVAL OF GONADS ON PHYSIOLOGI					1. Define castration-medical & surgical castration		

	CAL FUNCTION					<ol style="list-style-type: none"> 2. Role of continuous GnRH administration in gonadal suppression 3. Effects of gonadal removal in males & females <ol style="list-style-type: none"> a. Before puberty b. After puberty <ol style="list-style-type: none"> i. Bone homeostasis ii. Cardiovascular health iii. Prostate(males) iv. Reproductive behaviour v. Other organ systems 4. clinical applications of castration <ol style="list-style-type: none"> a. malignancies 		
P.Y.9.8	PHYSIOLOGY OF PREGNANCY, PARTURITION ,& LACTATION,P SYCHOLOGY &				K-KH-Y	<ol style="list-style-type: none"> 1. events leading to Fertilization <ol style="list-style-type: none"> a. Capacitation b. Acrosome reaction 2. Physiology of implantation & placentation. 3. Maternal-Fetal-placental unit 	BERNE & LEVY	BORON WILLIAM'S OBSTETRICS GUYTON

	<p>PSYCHIATRY DISORDERS ASSOCIATED WITH IT.</p>					<ol style="list-style-type: none"> 4. Physiological basis of morning sickness 5. Placental endocrinology. <ol style="list-style-type: none"> a. Luteal-placental shift 6. Physiological changes during pregnancy 7. Diabetogenicity of pregnancy 8. Physiology of Parturition <ol style="list-style-type: none"> a. Placental CRH and the Fetal Adrenal Axis. b. Role of Oxytocin, <ol style="list-style-type: none"> i. Ferguson's reflex c. prostaglandins, d. Cervical softening & effacement e. Mechanical factors f. uterine size. g. Relaxin h. Positive feedback 9. Mammogenesis & Lactation <ol style="list-style-type: none"> a. Hormonal regulation of mammary gland development. b. Effect of lactation on menstrual cycle 10. FETA & NEONATAL Physiology 		
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						<ul style="list-style-type: none"> a. Physiology of fetal growth- role of hormones b. Development & maturation of cardiopulmonary system c. Cardiopulmonary changes after birth d. Challenges to neonatal thermoregulation, fluid & acid-base balance e. Physiological basis of neonatal respiratory distress syndrome 		
P.Y.9.9	NORMAL SEMEN ANALYSIS REPORT INCLUDING SPERM COUNT, SPERM MORPHOLOGY, SPERM MOTILITY AS PER WHO GUIDELINES AND				K-KH-Y	<ul style="list-style-type: none"> 1. Indications of semen analysis 2. NORMAL SEMEN ANALYSIS <ul style="list-style-type: none"> a. Physical & biochemical properties b. SPERM COUNT, c. SPERM MORPHOLOGY, d. SPERM MOTILITY AS PER WHO GUIDELINES AND D 	SHAW text book of gynecology	BORON, BERNE & LEVY GUYTON WILLIAM'S OBSTETRICS

	DISCUSS THE RESULTS					3. INTERPRETATION OF RESULTS		
P.Y.9.10	PHYSIOLOGICAL BASIS OF VARIOUS PREGNANCY TESTS				K-KH-Y	<ul style="list-style-type: none"> a. Immunological tests for beta-hCG b. Source & functions of hCG c. Structure of Hcg: alpha & beta chains d. Other hormones with similar structure <ul style="list-style-type: none"> a. Non-specific alpha & specific beta e. Plasma levels of hCG during pregnancy f. Physiological basis of false positive pregnancy test g. Sonographic recognition of pregnancy 	Ganongs physiology	BORON, WILLIAM'S OBSTETRICS
PY 9.11	HORMONAL CHANGES AND THEIR EFFECTS DURING PERIMENOPAUSE AND MENOPAUSE				K-KH-Y	<ul style="list-style-type: none"> 1. Menopausal syndrome 2. Physical changes in menopause 3. Post menopausal changes in ovarian steroids & gonadotropins 4. Physiological basis, benefits & risks of hormone replacement therapy (HRT) 	GANONG	BORON, WILLIAM'S OBSTETRICS

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NEUROPHYSIOLOGY

Comp . No.	COMPETENCY	LECT URE No. Of HOURS	PRAC/ SGD/ Tut/ Int hrs	SDL hrs	Domain/level/core	OBJECTIVES	BASE BOOK	REFEREN CE BOOK
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<p>PY10 .1</p>	<p>Organization of nervous system</p>				<p>K-KH-Y</p>	<ol style="list-style-type: none"> 1. Divisions of nervous systems: central, peripheral & autonomic nervous system 2. Divisions of central nervous system: <ol style="list-style-type: none"> a. Telencephalon, Cerebellum, diencephalon, midbrain, pons, Medulla, and spinal cord b. Telencephalon: <ol style="list-style-type: none"> i. Lobes of cerebral hemispheres ii. Gray matter <ol style="list-style-type: none"> 1. Cerebral cortex: six layered structure and structural complexity 2. topographic organization: modular localization & somatotopy 3. basal ganglia iii. white matter <ol style="list-style-type: none"> 1. relative volume of white to grey matter, functional importance of association fibres, commissural fibres, projection fibres. 	<p>Boron and Boulp aep &</p>	<p>Best & Taylor Berne&lev y physiology</p>
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						<ul style="list-style-type: none"> c. Diencephalon: thalamus & subthalamus, hypothalamus d. Cerebellum: <ul style="list-style-type: none"> i. Functional divisions of cerebellum: vestibulocerebellum, spinocerebellum, cerebrocerebellum e. Brain stem: mid-brain, pons & medulla, reticular formation. f. Spinal cord: segmental organization, ascending & descending tracts <p>3. Peripheral nervous system: somatic nervous system (external environment) & autonomic nervous system (internal environment)</p> <p>4. Neuronal microenvironment</p> <ul style="list-style-type: none"> a. Brain extracellular fluid b. CSF –formation, circulation, resorption, composition & functions 		
PY10 .2	Functions and properties of synapse, reflex & receptors				K-KH-Y	<ul style="list-style-type: none"> 1. Definition of synapse 2. characteristics of electrical synapses and chemical synapses 2. specializations found in the presynaptic and postsynaptic elements of a chemical synapse 3. sequence of events connect the arrival of the action potential at the presynaptic terminal to the entry of calcium 	Berne & levy physiology	Boron and Boulpaep

					<p>4. sequence of events connect the entry of calcium at the presynaptic terminal to release of neurotransmitter</p> <p>5. What is the quantal hypothesis of synaptic transmission, and how does the presence of miniature end plate potentials support this hypothesis?</p> <p>6. Why is the reversal potential of a typical EPSP near 0 mV?</p> <p>7. What distinguishes EPSPs and IPSPs in terms of underlying ionic conductances, effect on membrane potential, and neuronal firing probability?</p> <p>8. How does an IPSP still inhibit a neuron when its reversal potential is equal to or more positive than the neuron's resting potential?</p> <p>Properties of synapse-</p> <ol style="list-style-type: none"> 1. Spatial & temporal summation, 2. Frequency, amplitude, phase modulation <p>9. What are the mechanisms by which synaptic effects can change over time?</p> <p>10. criteria for determining a substance is a neurotransmitter, and major excitatory and inhibitory neurotransmitters</p> <p>11. major classes of neurotransmitter receptors</p>		
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<p>PY10 .3</p>	<p>Somatic sensations & sensory tracts</p>				<p>K-KH-Y</p>	<ol style="list-style-type: none"> 1. Sensory receptors 2. major modalities of somatosensory information, and corresponding pathways that convey each from the periphery to the primary somatosensory cortex? 2. What body regions and categories of information are the exteroceptive, proprioceptive, and enteroceptive divisions of the somatosensory system associated with? 3. What are the main receptors for fine/discriminatory touch sensations? 4. Sensory coding- psychophysical laws, rate coding and temporal coding, coding of modality, location (receptive fields) , frequency, intensity, duration (receptor adaptation), labeled line principle, 4. What types of somatosensory information does the cerebellum receive? 5. What are the main receptors for pain and temperature touch sensations, Five pain pathways- Spinothalamic, spinoreticular, spinomesencephalic, spinothalamic & cervico-thalamic 6. What is the phenomenon of referred pain? 7. What proteins are involved in transducing different categories of somatosensory information? 	<p>Berne & levy physiology</p>	<p>Ganongs physiology</p> <p>Kandels principles of neural science</p>
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						<p>8. How do descending pathways act to regulate the flow of activity in ascending somatosensory pathways? Endogenous analgesia system.</p> <p>Gate control theory, dynamic neural mapping phantom limb pain</p> <p>Physiological basis of pain management, TENS</p>		
PY10 .4	<p>Motor tracts, mechanism of maintenance of tone, control of body movements, posture and equilibrium, vestibular apparatus.</p>				K-KH-Y	<p>Motor pathways, motorcortex</p> <ol style="list-style-type: none"> 1. Reflex motor activities, rhythmic motor activities, voluntary movements: 2. What is a central pattern generator, and what types of movements can it be used for? 3. Medial and lateral descending pathways in motor control. Limitation of the concept of pyramidal & extrapyramidal system. Corticospinal tract 4. Final common motor pathway 5. Effect of lesions at various levels 6. Regulation of Tone: <ol style="list-style-type: none"> a. Muscle receptors b. Alpha-gamma linkage c. Spasticity & rigidity 7. What is decerebrate rigidity, 8. Various cortical motor areas and their functions. What distinguishes the cortical motor areas from each other? 	Berne & levy physiology	Kandels principles of neural science

					<p>Compare & contrast motor and sensory homunculus</p> <p>9. What motor parameters are coded for in the activity of neurons in motor cortex: coding</p> <p>10. direction of movement, velocity, force, trajectory, population & vector coding</p> <p>vestibular apparatus:</p> <p>1. structure-function relationships of five receptors organs of vestibular apparatus – semicircular canals & otolith organs, central vestibular connections, disorders of vestibular system</p> <p>posture and equilibrium</p> <p>1. control of center of gravity- antigravity support & automatic postural responses, sensory integration for maintenance of posture and equilibrium- somatosensory, vestibular, visual</p> <p>2. control of posture & equilibrium by brain stem, cerebellum, cerebral cortex</p> <p>3. disorders of posture & Equilibrium</p> <p>control of body movements:</p> <p>1. control of locomotion: spinal central pattern generators, brain stem control of locomotion</p> <p>2. gaze control mechanisms:</p>		
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						<ul style="list-style-type: none"> a. How do the vestibuloocular and optokinetic reflexes act to stabilize gaze? How do they complement each other? b. What are the roles of saccades and smooth pursuit movements in visual tracking? c. What is nystagmus, and what types of sensory stimulation can drive nystagmus in a normal individual? 		
PY10 .6	Spinal cord, its functions, lesions & sensory disturbances				K-KH-Y	<ol style="list-style-type: none"> 1. gray matter & white matter of spinal cord 2. structure-function relationships for Rexed laminae of spinal gray matter - ventral horn - Musculotopic Organization of Motor Neurons in the Ventral Horn, dorsal horn, location & organization of white matter tracts – lamination & somatotopy 3. What is a motor neuron, and how are α and γ motor neurons different? 4. What is a reflex, and why are reflexes useful for clinical and scientific understanding? 5. What information about the state of the muscle is sensed by the muscle? 	Berne & Levy physiology	Kandel's principles of neural science

						<p>spindles, and what afferent fibers convey this information to the central nervous system (CNS)?</p> <ol style="list-style-type: none"> 6. How do γ motor neurons modulate the responses of the muscle spindle? 7. What are the pathways and functions of the basic spinal reflexes? 8. Lesions of spinal cord & clinical features 		
PY10 .5	Structure and functions of reticular activating system, autonomic nervous system.				K-KH-Y	<p>Reticular activating system:</p> <ol style="list-style-type: none"> 1. Neurophysiology of modulatory mono-aminergic & cholinergic neurons in brain stem: arousal ,sleep & wakefulness 2. Autonomic nervous system <ol style="list-style-type: none"> 1. What are the similarities and differences in the general organizations of the parasympathetic and sympathetic systems? 2. What are the respective actions of the parasympathetic and sympathetic innervation of the eye, and what symptoms arise when the parasympathetic or sympathetic innervation is lost? 3. What are the changes in the balance of parasympathetic and sympathetic activity to the bladder that occur during micturation? 4. What is meant by a "servomechanism"? 	Berne & levy physiology	Kandels principles of neural science

						<p>5. What are the specific feedback loops that regulate body temperature, feeding and body weight, and water intake?</p> <p>6. What is the role of the hypothalamus in each of these feedback loops?</p>		
PY10 .7	<p>Functions of cerebral cortex, basal ganglia, thalamus, hypothalamus, cerebellum, limbic system and their abnormalities.</p>				K-KH-Y	<p>Cerebral cortex:</p> <ol style="list-style-type: none"> 1. What is the basic layering pattern of the neocortex, and how do cortical inputs and outputs align with this layering pattern? 2. Regional variation in neocortical structure and functional significance of the variation in the layering pattern between cortical areas? what is archaecortex and paleocortex? Columnar organization of cortex. 3. What are the major functions of each of the lobes of the cerebrum? <ol style="list-style-type: none"> a. Frontal ,parietal, temporal and occipital <p>Basal ganglia:</p> <ol style="list-style-type: none"> 1. What are the direct ,indirect, hyperdirect pathways in the basal ganglia, and how does their activity influence movement? 2. How is the balance of activity between the direct and indirect pathways altered in Parkinson's disease and Huntington's disease? 	Berne & levy physiology	Kandels principles of neural science

						<p>Thalamus:</p> <ol style="list-style-type: none"> 1. Structure function relationship of thalamic nuclei, thalamic disorders <p>Hypothalamus:</p> <ol style="list-style-type: none"> 1. Structure function relationship of hypothalamic nuclei 2. Hypothalamic regulation of six vital functions: blood pressure & electrolyte balance, energy balance, reproductive behavior, body temperature, defensive behavior, circadian behavior & sleep-wake cycle. <p>Cerebellum:</p> <ol style="list-style-type: none"> 1. How does the organization of the mossy and olivocerebellar (climbing) fiber afferent systems to the cerebellum differ in their origins, topography, and synaptic connections. 2. What is the geometric relationship between the major cellular elements of the cerebellar cortex? Cerebellar microcircuitry. 3. What are simple and complex spikes in Purkinje cells? 4. Functions of vestibulocerebellum, spinocerebellum & cerebrocerebellum 5. Motor learning & cerebellum-longterm depression (LTD) 		
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						<p>6. Clinical features of Cerebellar disorders</p> <p>Limbic system:</p> <ol style="list-style-type: none"> 1. Structure-function relationship of limbic lobe, papez circuit, sham rage, amygala- fear conditioning, cortical control of emotions, hypothalamus & emotions, kluver-bucy syndrome 		
PY10 .8	Behavioural and EEG characteristics of sleep and mechanisms responsible for its production				K-KH-Y	<ol style="list-style-type: none"> 1. Explain the interplay between brainstem neurons that contain norepinephrine, serotonin, and acetylcholine and diencephalic histaminergic and GABAergic neurons in mediating transitions between sleep and wakefulness. 2. Explain the physiological basis and the main clinical uses of the electroencephalogram (EEG). 3. Describe possible causes of seizure activity and explain the differences between generalized and partial seizures. 4. Identify the primary types of cortical rhythms recorded in an EEG that reflect different states of wakefulness and sleep. 5. Summarize the behavioral and EEG characteristics of rapid eye movement (REM) sleep and the four stages of non-REM sleep. 	Ganong's physiology	Kandel's principles of neural science

						<ol style="list-style-type: none"> 6. Describe the pattern of normal nighttime sleep in adults and the variations in this pattern from birth to old age. 7. Describe the symptoms of narcolepsy, sleep apnea, and other sleep disorders. 8. Describe the roles of the suprachiasmatic nuclei (SCN) and melatonin in regulation of the circadian rhythm. 		
PY10 .9	Physiological basis of leaning&memory, speech				K-KH-Y	<ol style="list-style-type: none"> 1. Describe the role of brain imaging techniques in identifying normal brain function and changes caused by brain damage. 2. Describe the various forms of memory and identify the parts of the brain involved in memory processing and storage. 3. Define synaptic plasticity, long-term potentiation (LTP),critical role of NMDA receptors, long-term depression (LTD), habituation, and sensitization, and explain their roles in learning and memory. 4. Molecular physiology of explicit & implicit memory, structure-functional relationships of hippocampal circuitry. 5. Identify the abnormalities of brain structure and function that are characteristic of Alzheimer disease. 	Ganong's physiology	Berne&levy physiology Kandels principles of neural science

						<ul style="list-style-type: none"> 6. Define the terms categorical hemisphere and representational hemisphere and summarize the differences between them, personal neglect & representational neglect syndrome 7. Interhemispheric Communication and the Corpus Callosum 8. Identify the cortical areas important for language and their interconnections. 9. Summarize the differences between fluent and nonfluent aphasia and explain each type on the basis of its pathophysiology. 		
PY 10.10	Chemical transmission in the nervous system				K-KH-Y	Refer to PY10.2		
PY 10.13	Pereception of smell & taste					<ul style="list-style-type: none"> 1. Describe the structure and function of the neural elements in the olfactory epithelium and olfactory bulb. 2. Identify the significance of the family of olfactory receptor genes. 3. Explain how odorant receptors are activated and the mechanism by which signal transduction occurs in these receptors. 4. components of the pathway by which impulses generated in the olfactory epithelium reach five regions of the olfactory cortex. 5. Vomeronasal organs & pheromones. 	Ganong's physiology	Berne & levy physiology Kandels principles of neural science

						<ol style="list-style-type: none"> 6. Describe the location and cellular composition of taste buds. 7. Name the five major taste modalities and compare the signal transduction mechanisms in the receptors mediating these different taste modalities. 8. components of the pathways by which impulses generated in taste receptors reach the gustatory region of the insular cortex. 		
PY 10.14	Pathophysiology of smell & taste disorders				K-KH-Y	<p>Name and discuss abnormalities in odor and taste sensations</p> <ol style="list-style-type: none"> 1. Anosmia, hyposmia, hyperosmia, dysosmia, kallmans syndrome, congenital anosmia, olfactory aura before uncinata seizures 2. Ageusia, Hypogeusia, dysgeusia, super tasters, taste blindness 	Ganong's physiology	Berne & levy physiology
PY 10.15	Functional anatomy of ear, auditory pathways & physiology of hearing				K-KH-Y	<ol style="list-style-type: none"> 1. Principles of acoustics 2. Physiology of external ear: pinna in sound localization, external auditory meatus –conduit, tube resonator 3. Physiology of middle ear: ear ossicles and middle ear muscles, Impedance matching and its mechanisms, neurophysiology of acoustic middle ear reflex, 	Berne & levy physiology	<p>Boron & boupaep</p> <p>Best & taylor physiology</p> <p>Kandels principles of neural science</p>

						<p>regulation of middle ear pressure- Eustachian tube</p> <ol style="list-style-type: none"> 4. Physiology of inner ear: structure-function relationship of organ of corti, travelling wave theory, inner hair cells and auditory transduction, properties of basilar membrane, tonotopic mapping- place coding 5. outer hair cells & Cochlear microamplifier, cochlear microphonics, summated potentials, action potentials. 6. Auditory fibres- characteristic frequency and tuning curve, frequency coding, volley principle, phase locking, duplex theory 7. Central Auditory pathways & auditory processing: directional hearing- interaural time and intensity differences, role of superior olivary complex 8. Auditory cortex. 		
PY 10.16	Pathophysiology of deafness & Hearing tests				K-KH-Y	<ol style="list-style-type: none"> 1. Conductive and sensorineural hearing loss- cochlear & retrocochlear hearing loss 2. Bed side tests of hearing: tuning fork tests- rinne's test, Weber 	Berne & levy physiology	<p>Kandels principles of neural science</p> <p>Hearing & disorders</p>

						3. Audiometry- Pure tone audiogram, impedance audiometry, otoacoustic emissions, BERA		by aage moller
PY 10.17	Functional anatomy of eye, physiology of image formation, physiology of vision including color vision, refractive errors, color blindness, physiology of pupil & light reflex				K-KH-Y	<ol style="list-style-type: none"> 1. Structure function relationship of eye: <ol style="list-style-type: none"> a. cornea: functions mechanisms responsible for corneal transparency, b. structure & functions of tear film, c. formation, circulation and absorption of aqueous humour- functions and Glaucoma d. functions of iris diaphragm & lens- physiology of accommodation e. physiology of pupillary light reflex- sympathetic & parasympathetic control of intrinsic eye muscles f. cells & structure of human retina 2. Optics of vision: principles of image formation in the eye, total dioptric power of eye- contribution of lens & cornea to it, refractive errors and their correction- myopia, hypermetropia, presbyopia & astigmatism, visual acuity and reasons for high visual acuity in fovea centralis, blind spot 3. Photoreceptor cells in the eye and their properties, phototransduction, 	Ganong's physiology	Berne & levy physiology GUYTON Kandel's principles of neural science

						<p>physiology of light adaptation and dark adaptation, intrinsically photosensitive ganglion cells and their function</p> <ol style="list-style-type: none"> 4. Retinal circuitry, centre-surround receptive field of ganglion cells & bipolar cells, ON-centre & OFF-centre cells, types of retinal ganglion cells, visual pathway, 5. processing of vision in lateral geniculate body and visual cortex, orientation columns, dominance columns, color blobs, simple cells, complex cells, hypercomplex cells, P & M pathways in extrastriate cortex, dorsal & ventral visual streams and their functions 6. cortical areas for processing of location, motion, form, face, colour, depth 7. binocular vision and physiology of stereopsis 8. color vision- trichromatic & opponens process theory, cortical processing of color vision, colour blindness 9. disorders of visual processing: Agnosias 		
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PY 10.18	Physiological basis of lesions in visual pathway				K-KH-Y	Pathophysiology and clinical features in <ol style="list-style-type: none"> 1. lesions of optic nerve 2. lesions of optic chiasma 3. lesions of optic tracts 4. lesions of optic radiation 5. lesions of visual cortex: macular sparing effect 	Ganon gs physio logy	Berne & levy physiology GUYTON
PY 10.19	Auditory and visual evoked potentials				K-KH-Y	<ol style="list-style-type: none"> 1. electrophysiology of evoked potentials-EEG & signal averaging 2. VEP-Visual evoked potential <ol style="list-style-type: none"> a. N75,P100,N135-amplitudes & latencies, clinical applications b. Pattern shift & flash VEP 3. Auditory evoked potentials: <ol style="list-style-type: none"> a. Near field potentials: <ol style="list-style-type: none"> i. Coclear nerve compound action potential, summing potential, electrocochleography b. Far field potentials: <ol style="list-style-type: none"> i. Auditory brain stem response (ABR)-I-V waves c. Amplitudes and latencies of waves and their clinical importance 	Berne & levy physio logy	JUN KIMURA electrodia gnosis, keith chiappa evoked potentials, Hearing & disorders by Aage Møller

<p>PY 10.11 &</p>	<p>Clinical examination of nervous system: Higher functions, sensory system, motor system, reflexes, cranial nerves</p> <p>&</p>			<p>DOA P</p>	<p>S-P-Y</p>	<p>Clinical examination of sensory system: The student should be able to examine correctly:</p> <ol style="list-style-type: none"> 1. Tactile sensation 2. Pain & temperature <ol style="list-style-type: none"> a. Superficial & deep pain b. Position & vibration 2. Romberg's sign 3. Discriminative sensations <ol style="list-style-type: none"> a. Tactile localization b. Two-point discrimination c. Stereognosis d. Graphesthesia e. Extinction <p>Clinical examination of motor system: The student should be able to examine correctly:</p> <ol style="list-style-type: none"> 1. Muscle bulk/nutritional state 2. Muscle tone 3. Muscle power <ol style="list-style-type: none"> a. Upper limb, lower limb & trunk muscles b. Grading of power 4. Co-ordination of movements 5. Involuntary movements 6. Gait 7. Reflexes: <ol style="list-style-type: none"> 1. Superficial reflexes: corneal & conjunctival reflex, plantar reflex, abdominal reflex 2. Deep reflexes 	<p>Bates guide to physical examination</p>	<p>Spiras art & science of bedside diagnosis</p> <p>C.L.GHAI</p>
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<p>PY10 .20</p>	<p>Demonstrate</p> <ol style="list-style-type: none"> 1. Tests of visual acuity, colour vision, field of vision 2. Tests of hearing <p>Tests of taste & smell</p>					<ol style="list-style-type: none"> a. Biceps jerk, triceps jerk, supinator jerk, knee jerk & ankle jerk <ol style="list-style-type: none"> 3. The student should know <ol style="list-style-type: none"> a. Grading of deep reflexes b. Afferent, efferent & spinal segments for each deep reflex c. Reinforcement: jendrassik procedure d. Correct technique for the Use of Taylor's reflex hammer, its parts, instructions to the subject, postural adjustments during elicitation <p>The student should be able to perform clinical examination of cranial nerves I-XII correctly</p> <p>The student should be able to examine cranial nerve II & VIII in detail as follows</p> <p>Tests of vision:</p> <ol style="list-style-type: none"> 1. Use of Snellen's chart for visual acuity, Snellen's fraction for each eye 2. Colour vision: Ishihara chart – number identification, finger tracing 		
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						<ul style="list-style-type: none"> 3. Field of vision: finger confrontation test <p>Tests of hearing: tuning fork tests</p> <ul style="list-style-type: none"> 1. Rinnes's test 2. Webers test <p>Tests of smell & taste</p>		
PY 10.12	Identify normal EEG Waveforms			DEMONSTRATION	S-S-Y	<ul style="list-style-type: none"> 1. Frequencies & amplitudes of EEG Waves 		

INTEGRATED PHYSIOLOGY

Comp . No.	COMPETENCY	LECT URE No. Of HOUR S	PRAC/ SGD/ Tut/ Int hrs	SDL hrs	DOMAIN- LEVEL- CORE	OBJECTIVES	BASE BOOK	REFEREN CE BOOK
PY11 .1	Mechanisms of temperature regulation				K-KH-Y	<ol style="list-style-type: none"> 1. advantages of homeothermy 2. core & shell temperature <ol style="list-style-type: none"> a. temperature measurement sites & methods b. physiological fluctuations in core body temperature <ol style="list-style-type: none"> i. circadian rhythms in temperature: Physiological evening rise of temperature ii. normal mean oral temperature: diurnal variation iii. post ovulatory rise in core body temperature iv. effect of exercise, age, emotions 3. mechanism of heat gain <ol style="list-style-type: none"> a. physical mechanisms: conduction, convection & radiation b. physiological mechanisms: BMR, Food intake (specific dynamic 	Ganon g physiology	BORON PHYSIOLOGY

						<p>action), muscular activity & shivering thermogenesis</p> <p>c. Non-shivering thermogenesis:</p> <ul style="list-style-type: none"> i. Role in neonatal thermoregulation ii. Role of brown adipose tissue iii. Uncouplers & hormones <p>d. Heat conservation mechanisms:</p> <ul style="list-style-type: none"> i. role of subcutaneous fat, venae comitantes & countercurrent exchangers, shunts & cutaneous vasoconstriction, horripilation e. Behavioural mechanism for heat gain/conservation <p>4. role of thermal gradient in determining direction of heat transfer by physical mechanisms</p> <p>5. mechanisms of heat loss</p> <ul style="list-style-type: none"> a. physical mechanisms: conduction, convection & radiation, insensible water loss b. physiological mechanisms: sweating, panting c. role of sweating in heat loss against thermal gradient d. Behavioural mechanism for heat loss <p>6. regulation of core body temperature</p>		
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						<ul style="list-style-type: none"> a. thermoregulatory control system b. sensors, hypothalamic integrating centres & effector mechanisms c. feedforward (skin thermoreceptors) d. feedback mechanisms (core thermoreceptors) e. thermoregulatory set point, error, & gain <p>7. pathophysiology of hypothermia & hyperthermia, frost bite</p> <p>8. Fever</p> <ul style="list-style-type: none"> a. Criteria for fever b. Pathophysiology of fever & its management c. Endogenous pyrogens d. Set point alteration in fever vs heat stroke <p>9. Pathophysiology of heat stroke & its management</p> <p>10. Clinical physiology of Thermoregulatory challenges in newborn and its management</p>		
PY 11.2	Adaptation to altered temperature (heat & cold)				K-KH-Y	REFER PY 11.1	Ganong physiology	BORON PHYSIOLOGY
PY 11.3	Mechanism of fever, cold				K-KH-Y	REFER PY 11.1	Ganong	BORON PHYSIOLOGY

	injury & heat stroke						physiology	
PY 11.4 & PY11.8	<p>Cardio-respiratory and metabolic adjustments to exercise: Physical training effects</p> <p>Describe & compare CARDIORESPIRATORY CHANGES Indifferent types of exercises (Isometric & isotonic) with that in the resting state and under different environment conditions (heat & cold)</p>				K-KH-Y	<ol style="list-style-type: none"> 1. Define VO₂max and its determinants. Physiological & clinical importance of VO₂max 2. Pattern of response of major cardiovascular variables (Systolic, diastolic, mean blood pressures, heart rate, stroke volume, cardiac output, peripheral vascular resistance, rate pressure product), respiratory variables and their physiological mechanisms in <ol style="list-style-type: none"> 1. Short term light to moderate aerobic exercise <ol style="list-style-type: none"> a. Cardiovascular Steady state 2. Long term moderate to heavy submaximal aerobic exercise <ol style="list-style-type: none"> a. Cardiovascular drift 3. Incremental aerobic exercise to maximum 4. Static/isometric exercise 5. Dynamic resistance exercise 6. Cardiac output distribution at rest and various types & intensities of exercise 7. Maximum cardiac output and cardiac reserve 2. Metabolic adjustments to exercise 	Exercise physiology by plowman & smith	GUYTON BORON PHYSIOLOGY

						<ol style="list-style-type: none"> 1. Source of energy for different intensities & durations of exercise 2. Anaerobic threshold 3. Oxygen debt & excessive post exercise oxygen consumption <p>Physiology of Exercise training adaptations:</p> <ol style="list-style-type: none"> 1. Cardiovascular adaptations: <ol style="list-style-type: none"> a. Anatomical & physiological b. Cardiac dimensions, Cardiac output, stroke volume, heart rate, plasma volume, blood pressure, peripheral vascular resistance, VO2max c. Sinus bradycardia of athletes 2. Respiratory adaptations <ol style="list-style-type: none"> a. Changes in lung volumes & capacities b. Pulmonary ventilation & external /internal respiration 3. Muscle adaptation: exercise hypertrophy <p>physiology of exercise in the heat</p> <ol style="list-style-type: none"> 1. Body temperature during exercise in the heat: uncompensable heat stress 		
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						<ol style="list-style-type: none"> 2. Mechanisms of heat loss during exercise at different ambient temperatures 3. Cardiovascular demands of exercise in the heat <ol style="list-style-type: none"> a. Competition between thermoregulation & muscle blood supply b. Reasons for low VO₂max 4. Physiology of heat acclimatization, 5. hydration during exercise: composition, rate & amount of fluid intake 6. exertional heat exhaustion, exertional heat injury, exertional heat stroke 7. prevention of exertional heat illness <p>physiology of exercise in the cold:</p> <ol style="list-style-type: none"> 1. heat production & heat conservation mechanisms during exercise in cold 2. pathophysiology cold-induced injuries & prevention 		
PY11 .5	Physiological consequences of sedentary life style				K-KH-Y	<ol style="list-style-type: none"> 1. describing and measuring sedentary behaviour 2. physiological consequences of sedentary behaviour <ol style="list-style-type: none"> a. sedentary life style & obesity b. cardiometabolic consequences 	INTER NET: REVIE W ARTC LE Physio	

						<ul style="list-style-type: none"> c. sedentary life style & bone health d. sedentary life style & vascular health e. sedentary behaviour & cancer f. sedentary behaviour & psychosocial health <p>3. Physiological principles of life style modification</p>	logical and health implications of a sedentary lifestyle by Tremblay et al	
PY11.6	Physiology of infancy				K-KH-N	<ul style="list-style-type: none"> 1. Define period of infancy 2. What are developmental milestones & different domains of milestones 3. Developmental milestones in the first year of life in the age groups 0-2, 2-6, 6-12 months <ul style="list-style-type: none"> a. Gross motor b. Fine motor c. Cognitive d. Communication & language 4. Myelination of different areas of nervous system and physiological implications 5. Neural plasticity & brain growth in the first year of life 		Nelsons textbook of pediatrics ,Vol.1
PY11.7	Physiology of aging; free radicals & antioxidants				K-KH-N	<ul style="list-style-type: none"> 1. concepts of AGING: Aging vs senescence, Biological age vs chronological age 	BORON Physiology	

						<ol style="list-style-type: none"> 2. biomarkers of aging, natural selection & aging 3. theories of aging 4. telomere hypothesis: Hayflick limit 5. Cellular & molecular mechanisms of aging 6. Aging changes in various organ systems 7. Physiological basis of slowing the aging process 8. Role of reactive oxygen species & anti-oxidants in aging 		
PY 11.9	INTERPRET GROWTH CHARTS				K-KH-N	<ol style="list-style-type: none"> 1. Normal distribution & its properties 2. Use of normal distribution for physiological & anthropometric measurements 3. concept of percentile: Meaning of 3rd, 15th, 50th, 85th, 97th percentile 4. use of 3rd percentile & 97th percentile as the cutoff for lower & upper range of normalcy. 5. Z-score 6. Components of growth chart <ol style="list-style-type: none"> a. Growth charts for height for age, weight for age, weight for height for boys & girls, head 		<p>Nelsons textbook of pediatrics ,Vol.1</p> <p>O P Ghai Text book of paediatrics</p>

						<p>circumference for age</p> <p>7. Uses of growth charts:</p> <ol style="list-style-type: none"> a. One time measurement b. Serial measurements: growth velocity <p>8. Growth standards –CDC, WHO growth standards.</p>		
PY 11.10	Interpret anthropometric assessment of infants				K-KH-N	<ol style="list-style-type: none"> 1. weight, length ,standing height , circumferences- head, chest, abdomen, mid-arm, skin fold thickness, arm span, upper body segment-low body segment ratio. 2. Normal range of anthropometric measurements 3. Use of growth chart for the evaluation of anthropometric measurements 	Pediatrics by O.P. Ghai	Nelsons textbook of pediatrics ,Vol.1
PY 11.11	Concept , criteria for diagnosis of brain death & its implications				K-KH-Y	<p>Concept , criteria for diagnosis of brain death</p> <ol style="list-style-type: none"> 1. Pre-requisites for determination of brain stem: persistence of cardiac function during mechanical ventilation, irreversible cause 2. Three criteria for determination of brain stem: 		Text book of critical care medicine by Vincent et al

						<ul style="list-style-type: none"> a. Absence of brain stem reflexes: testing brainstem reflexes <ul style="list-style-type: none"> i. Papillary response ii. Facial sensation & motor response iii. Gag & cough reflex iv. Assessment of eye movements b. Apnea: apnea test c. Irreversible coma or unresponsiveness <ul style="list-style-type: none"> 3. Confirmatory testing for brain death 4. Pathophysiology of brain death 5. Glasgow coma scale 6. Organ donation after brain death 		
PY 11.12	Physiological effects of meditation				K-KH-N	<ul style="list-style-type: none"> 1. Meditation, yoga, pranayama 2. Physiological effects of meditation on various organ systems 3. Role of meditation in the management of diseases. 	R.L.BI JILANI	

<p>PY 11.13</p>	<p>Obtain history & perform general examination</p>				<p>S-SH-Y</p>	<p>The student should be able elicit history under the following headings:</p> <ol style="list-style-type: none"> a. Identification data b. Personal history c. Family and social history d. Chief complaints e. History of previous illness, accidents ,surgeries f. History of present illness (teaching History taking is optional) <p>The student should be able to perform General physical examination correctly under the following headings:</p> <ol style="list-style-type: none"> a. General appearance/level of consciousness b. Orientation to environment c. Nutrition and build d. Head to toe examination Look for :pallor, icterus, clubbing, cyanosis, lymphadenopathy, edema e. Vital data 	<p>Bates guide to physical examination</p>	<p>Sapira's art & science of bed side diagnosis</p>
<p>PY 11.14</p>	<p>Basic life support</p>				<p>S-SH-Y</p>	<p>TO BE TAUGHT IN FOUNDATION COURSE</p>	<p>BLS 2015-2020</p>	

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