GENERAL HUMAN PHYSIOLOGY AND BIOCHEMISTRY, NUTRITION AND DIETICS-1DS1010102

A. GENERAL PHYSIOLOGY

1. Homeostasis: basic concept, feedback mechanisms.
2. Structure of cell membrane transport across cell membrane
3. Membrane potentials

B. BLOOD

1. Composition and functions of blood
2. Specific gravity, packed cell volume, factors affecting andmethods of determination.
3. Erythrocyte- morphology, functions &variations. Erythropoiesis & factors affecting Erythropoiesis
4. ESR- methods of estimation, factors affecting, variations & significance.
5. Hemoglobin- normal concentration, method of determination & variation in concentration.
6. Blood indices- MCV, MCH, MCHC-definition, normal values, variation.
7. Anemia- definition, classification, life span of RBC's destruction of RBC's, formation & fate of bile pigments, jaundice- types.
8. Leucocytes: classification, number, percentage, distribution morphology, properties, functions & variations. Role of lymphocytes in immunity, leucopoiesis life span & fate of leucocytes.
9. Thrombocytes – morphology, number, variations, function &thrombopoiesis.
10. Haemostasis- role of vasoconstrictors, platelet plug formation in haemostasis, coagulation factors, intrinsic & extrinsic pathwaysof coagulation, clot retraction.
11. Test of haemostatic function, platelet count, and clotting time, bleeding time, prothrombin time- normal values, method & variations. Anticoagulants- mechanism of action. Bleeding disorders.
12. Blood groups: ABO & Rh system, method of determination, importance, indications &dangers of blood transfusion, blood substitutes.
13. Blood volume: normal values, variations.
14. Body fluids: distribution of total body water, intracellular& extracellular compartments, major anions &cations in intra and extra cellular fluid.
15. Tissue fluid & lymph: formation of tissue fluid, composition, circulation & functions of lymph. Edema – causes.
16. Functions of reticuloendothelial system

C. MUSCLE AND NERVE

1. Classification of nerves,
2. Structure of skeletal muscle
3. Molecular mechanism of muscle contraction,
4. Neuromuscular transmission.
5. Properties of skeletal muscle.
6. Structure and properties of cardiac muscle & smooth muscle.

D. DIGESTIVE SYSTEM

1. Introduction to digestion: general structure of G.I. track, Innervations
2. Salivary glands: Structure of salivary glands, composition, regulation of secretion &functions of saliva

3. Stomach: Composition & functions of gastric juice, mechanism & regulation of gastric secretion.
4. Exocrine pancreas: structure, composition of pancreatic juice, functions of each component, regulation of pancreatic secretion.
5. Liver: structure, composition of bile, function of bile, regulation of secretion
6. Small intestine: Composition, functions & regulation of secretion of intestinal juice.
7. Large intestine: functions
8. Motor functions of GIT: Mastication, deglutition, gastric filling & emptying, movements of small and large intestine, defecation.

E. EXCRETORY SYSTEM:

1. Structure & functions of kidney, functional unit of kidney &functions of different parts, juxta glomerular apparatus, and renal blood flow.
2. Formation of urine: glomerular filtration, definition, determination, normal values, factors influencing G.F.R. tubular reabsorption- reabsorption of sodium, glucose, water& other substance.
3. Tubular secretion- secretion of urea, hydrogen & other substances.
4. Mechanism of concentration & dilution of urine.
5. Role of kidney in the regulation of Ph of the blood
6. Micturition: anatomy & innervations of urinary bladder, mechanism of micturition & abnormalities.

F. BODY TEMPRATURE & FUNCTIONS OF SKIN

G. ENDOCRINOLOGY

1. General endocrinology- Enumeration of endocrine glands & hormones- general functions of endocrine system, chemistry, mechanism of secretion, transport, metabolism, regulation of secretion of hormones
2. Hormones of pituitary & their actions, hypothalamic regulation of anterior pituitary function. Disorders of secretion of anterior pituitary hormones.
3. Posterior pituitary: functions, regulation & disorders of secretion.
4. Thyroid: histology, synthesis, secretion & transport of hormones, actions of hormones, regulation of secretion & disorders, thyroid function tests.
5. Adrenal cortex & medulla – synthesis, secretion, action, metabolism, regulation of secretion of hormones & disorders.
6. Other hormones- Angiotensin, A.N.F.

H. REPRODUCTION

1. Sex differentiation, physiologic anatomy of male & female sex organs
2. Female reproductive system: menstrual cycle, functions of ovary, actions of oestrogen& progesterone, control of secretion of ovarion hormones, tests for ovulation, fertilisation, implantation, maternal changes during pregnancy tests & parturition.
3. Lactation, composition of milk, factors controlling lactation, milk ejection reflex, male reproductive system, spermatogenesis, semen & contraception.

I. CARDIO VASCULAR SYSTEM

4. Functional anatomy & innervations of heart properties of cardiac muscle. Origin & propagation of cardiac impulse & heart block.
5. Electrocardiogram- normal electrocardiogram. Two changes in ECG in myocardial infarction

6. Cardiac cycle- phases, pressure changes in atria, ventricles & aorta.
7. Volume changes in ventricles. Jugular venous pulse, arterial pulse.
8. Heart sounds: mention of murmurs.
9. Heart rate: normal value, variation & regulation.
10. Cardiac output: definition, normal values, one method of determination, variation, factors affecting heart rate and stroke volume.
11. Arterial blood pressure: definition, normal values & variations, determinants, regulation & measurement of blood pressure.
12. Coronary circulation.
13. Cardiovascular homeostasis- exercise & posture

J. RESPIRATORY SYSTEM

1. Physiology of respiration: external and internal respiration.
2. Functional anatomy of respiratory passage & lungs.
3. Respiratory movements: muscles of respiration, mechanism of inflation & deflation of lungs. Intra pleural & intra pulmonary pressures & their changes during the phases of respiration.
4. Mechanism of breathing: surfactant, compliance & work of breathing
5. Spirometory: lung volumes & capacities definite on, normal values, significance, factors affecting vital capacity, variations in vital capacity, FEV & its variations.
6. Pulmonary ventilation- alveolar ventilation & dead space- ventilation.
7. Composition of inspired air, alveolar air and expired air.
8. Exchange of gases: diffusing capacity, factors affecting it.
9. Transport of oxygen & carbon dioxide in the blood.
10. Regulation of respiration- neural & chemical.
11. Hypoxia, cyanosis, dyspnoea, periodic breathing.
12. Artificial respiration, pulmonary function tests.

K. CENTRAL NERVOUS SYSTEM

1. Organization of central nervous system
2. Neuronal organization at spinal cord level
3. Synapse receptor, reflexes, sensations and tracts
4. Physiology of pain
5. Functions of cerebellum, thalamus, hypothalamus and cerebral cortex
6. Formation and functions of CSF
7. Autonomic nervous system

L. SPECIAL SENSES

1. Physiology of vision
2. Physiology of taste

PART-2-BIOCHEMISTRY AND NUTRITION

1. CHEMISTRY OF BIO-ORGANIC MOLECULES

- Carbohydrates: Definition, Biological importance and classification. Monosaccharides isomerism, anomerism. Sugar derivatives, Disaccharides, polysaccharides, structures of starch and glycogen.
- Lipids: Definition, biological importance and classification. Free fats and fatty acids, introduction to compound lipids. Hydrophobic groups. Cholesterol. Bile salts. Micelle. Bimolecular leaflet.
- Proteins: Biological importance. Amino acids: Classification. Introduction to peptides.

- Proteins: Simple and conjugated: globular and fibrous. Charge properties. Buffer action. Introduction to protein conformation. Denaturation.
- Nucleic acids: Building units. Nucleotides. Outline structure of DNA and RNA.
- High energy compounds: ATP, Phosphotidylamines, Thiolesters, enol phosphates.

2. MACRONUTRIENTS AND DIGESTION

- Energy needs: basal metabolic rate. Dietary carbohydrates, fibres. Dietary lipids, essential fatty acids. Nitrogen balance .essential amino acids, protein quality and requirement (methods for evaluation of protein quality to be excluded.) Protein calorie malnutrition.
- Balanced diet.
- Enzymatic hydrolysis of dietary carbohydrates. Mechanism of uptake of monosaccharides. Digestion and absorption of triacylglycerides. Enzymatic hydrolysis of dietary proteins and uptake of amino acids.

3.MICRONUTRIENTS

- Vitamins: Definition, classification, daily requirement, and source and deficiency symptoms. Brief account of water-soluble vitamins with biochemical functions. Vitamin-A functions including visual process. Vitamin-D and its role in calcium metabolism. Vitamin-E, Vitamin-K and gamma carboxylation. Introduction to ant vitamins and hypervitaminosis. Vitamin C and its role in dentistry.
- Minerals: Classification, daily requirements, Calcium and phosphate sources, uptake, excretion, function, serum calcium regulation. Iron: sources, uptake and transport. Heme and nonheme iron functions: deficiency. Iodine: Brief introduction to thyroxine synthesis. General functions of thyroxine. Fluoride: function, deficiency and excess. Indications of role of other materials.

4. ENERGY METABOLISM

- Overview: Outlines of glycosis, pyruvate oxidation and citric acid cycle. Beta oxidation of fatty acids. Electron transport chain and oxidative phosphorylation. Ketone body formation and utilization. Introduction to glycogenesis, fatty acid synthesis, lipogenesis and lipolysis. Gluconeogenesis. Lactate metabolism. Protein utilization for energy. Glucogenic and ketogenic amino acids. Integration of metabolism.

5.SPECIAL ASPECTS OF METABOLISM

- Importance of pentose phosphate pathway. Formation glucoronic acid. Outlines of cholesterol synthesis and breakdown. Ammonia metabolism. Urea formation. Phospho creatnine formation. Trans methylation. Amines. Introduction to other functions of amino acids including one transfer. Detoxification: typical reactions. Examples of toxic compounds. Oxygen toxicity.

6.BIOCHEMICAL GENNETIS AND PROTEIN SYNTHESIS

- Introduction to nucleotides, formation and degeneration. DNA as genetic material. Introduction to replication and transcription. Forms and functions of RNA. Genetic code and mutation. Outline of translation process. Antimetabolites and antibiotics interfering in replication, transcription and translation.
- **7. ENZYMES AND METABOLIC REGULATION**
- Enzymes: Definition, classification, specificity and active site.Co factors. Effect of PH, temperature and substrate concentration. Introduction to enzyme inhibitors, proenzymes and isoenzymes. Introduction to allosteric regulation, covalent modification and regulation by induction/ repression.

- Overview of hormones. Introduction to second messenger, cyclic AMP, calcium ion, inositol triphosphate. Mechanism of action of steroid hormones, epinephrine, glucagon and insulin in brief. Acid base regulation. Electrolyte balance.

8.STRUCTURAL COMPONENTS AND BLOOD PROTEINS

- Connective tissue: Collagen and elastin. Glycosa-minoglycans. Bone structure. Structure of membranes. Membrane associated processes in brief. Exocytosis and endocytosis. Introduction to cytoskeleton. Myofibril and muscle contraction in brief.
- Hemoglobin: function. Introduction to heme synthesis and degradation. Plasma proteins: classification and separation. Functions of albumin. A brief account of immunoglobulin's. Plasma lipoproteins: Formation, function and turnover.

9.MEDICAL BIOCHEMISTRY

- Regulation of blood glucose. Diabetes mellitus and related disorders. Evaluation of glycemic status.
- Hyperthyroidism and hypothyroidism: biochemical evaluation. Hyperlipoproteinemiaandatherosclerosis, approaches to treatment. Jaundice: classification and evaluation.
- Liver function test: plasma protein pattern, serum enzymes levels. Brief introduction to kidney function test and gastric function test.
- Acid base imbalance. Electrolyte imbalance: evaluation. Gout. Examples of genetic disorders including lysozomal storage disorders, glycogen storage disorders, glucose 6 phosphate dehydrogenase deficiency, hemoglobinopathies, inborn errors of amino acid metabolism and muscular dystrophy(one or two examples with biochemical bases will be adequate). Serum enzymes in diagnosis.

PRACTICALS

Physiology

- The following list of practicalis minimum and essential. All the practical have been categorized as procedures and demonstrations. The procedures are to be performed by the students during practical classes to acquire skills. All the procedures are to be included in the University practical examination. Those categorized as demonstrations are to be shown to the students during practical classes. However these demonstrations would not be included in the University examinations but question based on this would be given in the form of charts, graphs and calculations for interpretation by the students.

PROCEDURES

1. Enumeration ofRed Blood Cells
2. Enumeration ofWhite Blood Cells
3. Differential leucocyte counts
4. Determination of Haemoglobin
5. Determination of blood group
6. Determination of bleeding time and clotting time
7. Examination of pulse
8. Recording of blood pressure.

9 Thermometry

DEMONSTRATION:

1.Determinationofpackedcellvolumeand erythrocyte sedimentation rate
2.Determinationofspecificgravityofblood
3.Determinationoferythrocytefragility
4.Determinationofvital capacity and timed vital capacity
5.Skeletalmuscle experiments.
Study of laboratory appliances in experimental physiology. Frog' gastrocneminus sciatic preparation. Simple muscle curve, effects of two successive stimuli, effects of increasing strength of stimuli, effectsoftemperature, genesisoffatigueand tetanus. Effect of after load and freeload onmusclecontraction,calculationofwork done.
6. Electrocardiography:DemonstrationofrecordingofnormalElectrocardiogram
7.Clinicalexamination ofcardiovascular andrespiratorysystem.
8.Profilesofhypothyroidism andhyperthyroidism

TEXTBOOKS:

Guyton;Text book of Physiology.
Ganong; Review of Medical Physiology
Indu Khurana; Human physiology for dental students
Choudhari; Concise Medical Physiology
Chatetjee; Human Physiology
A.K.Jain; Human Physiology for BDS students

BOOKSFORREFERENCE:
i) Berne & Levey; Physiology
ii) West-Best &Taylor's,Physiologicalbasisof MedicalPractice

EXPERIMENTAL PHYSIOLOGY:
i) G.K.Pal:PracticalPhysiology
ii) C.L.Ghai; atext book ofpracticalphysiology
iii) A.K.Jain :PracticalPhysiology

BIOCHEMISTRY

PROCEDURES

1. Qualitative analysis of carbobydrates
2. Colour reactions of proteins and amino acids
3. Identification of nonprotein nitrogen substance
4. Normal constituents of urine
5. Abnormal constituents of urine
6. Analysis of saliva including amylase

7. Titration of Free and total acidity in gastric juice
8. Blood glucose estimation
9. Serum total protein estimation

Demonstration

1. Paper electrophoresis charts/clinical data evaluation
2. Glucose tolerance test profiles
3. Serumlipidprofiles
4. Profiles ofliverfunction
5. Urea, uricacid, creatnine profile' in kidneydisorders

TEXTBOOKS

1. Textbook of biochemistry for dental students by Vasudevan, D. M
2. Biochemistry by Satyanarayana, U
3. Fundamentals of biochemistry by Deb, A. C
4. Clinical chemistry by Chatterjea, MN
5. Concise textbook of biochemistry by Pattabiraman, T. N

BOOKSFORREFERENCE:

1. Text bookofBiochemistrywith"clinical correlations''1997, T.N.Devlin
2. Harpers Biochemistry,
3. Lippincott's Illustrated Q & A Review of Biochemistry (1st Edition) by Michael A. Lieberman, Rick Ricer
4. Lippincott's Illustrated Reviews: Biochemistry (4th Edition) by Pamela C. Champe, Denise R. Ferrier

EXPERIMENTAL BIOCHEMISTRY

1. Laboratory manual and practical biochemistry by Pattabiraman, T. N
2. Practical clinical biochemistry, methods and interpretations by Chawla,
3. Practical Biochemistry for medical and dental students by Chary, TM