

BIO-CHEMISTRY

SEMESTER- I

(Elementary / Preliminary Knowledge)

COURSE CONTENT

THEORY

1. Introduction to Biochemistry its Importance & scope in medicine.
2. Cell biology & Transport.
3. Overview of the Chemistry of carbohydrates, lipids, proteins constituent amino acids, nucleic acids and nucleo- proteins.
4. Enzymes, coenzymes, specificity of enzymes, factors influencing enzyme activity, mechanisms and regulation of enzyme action, classification of enzymes, clinical enzymology.
5. Vitamins - definition, classification, sources, daily requirements, functions, deficiency manifestations and hypervitaminoses.
6. Hemoglobin Chemistry, Structure, Functions and Hemoglobinopathies
7. General concepts of hormones, their biochemical functions, mechanisms of action of hormones in general
8. Xenobiotics.
9. Basic Immunology.
10. Food and Nutrition.

PRACTICAL

1. General Instruction of Students
2. Carbohydrate
3. protein
4. Urine & Urine Composition, Examination of Normal Urine
5. Examination of abnormal Urine

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BIO-CHEMISTRY

SEMESTER- II

COURSE CONTENT

THEORY

1. General aspects of metabolism.
2. Intermediary metabolism of carbohydrates - overview of glycolysis, glycogenesis, glycogenolysis, HMP shunt, gluconeogenesis, common metabolic pathway, metabolism of individual sugars and disorders of carbohydrate metabolism.
3. Overview of lipid metabolism comprising of fatty acid oxidation, synthesis, lipoproteins, acyl glycerols, cholesterol synthesis and disposal, ketosis, fatty liver atherosclerosis and hyperlipoproteinemias, obesity.
4. Overview of protein and amino acid metabolism.
5. Disposal of nitrogen - urea cycle - transamination and deamination, disposal of carbon skeletons of amino acids, formation of special products from amino acids and their biological significance.
6. Synthesis and breakdown of hemoglobin, jaundice, classification and importance, bile pigments and their significance porphrias.
7. Degradation of purines and pyrimidines and associated disorders.
8. Overview of metabolism of minerals and trace elements, their sources, daily requirements, biochemical and physiological functions, deficiency manifestations and toxicities - water metabolism.
9. Basic concepts of hepatobiliary, thyroid, adrenocortical and medullary pancreatic function tests.
10. Elementary knowledge of molecular biology including DNA organisation and repair, replication, RNA processing, genetic code, mutations, recombinant DNA and its application in medicine and allied sciences.
11. Cancer
12. Free Radical and antioxidants

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PRACTICAL

1. Colorimetry
2. Estimation Of Blood Glucose
3. Estimation of Total Centrifuge, Electrophoresis
4. Estimation of Total Serum Cholesterol
5. Estimation of Blood Urea
6. Estimation of Serum Bilirubin
7. Estimation of Serum Calcium
8. Serum Alkaline Phosphatase
9. Serum Creatinine

Demonstrations

1. pH Meter & ELISA
2. T.L.C.
3. Use of Radioisotope in medicine
4. Problem Base Learning
5. Glucometer

TEXT BOOKS RECOMMENDED (AS FOR MBBS STUDENTS)

1. Biochemistry for S.K. Gupta
2. Biochemistry by Vasudevan
3. Text book of Biochemistry by Shinde chatterjee

Books for further reading:-

1. Harper's Review of Biochemistry by D.W. Hartin et al 1986 Latest
2. Principles of Biochemistry by Lehninger A.L. (1982) Latest Worth N.Y.

Books for practical Experiments in Biochemistry

1. Practical Manual of Experiments in Biochemistry for the Medical students - Department of Biochemistry, era's medical college and hospital

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BIOCHEMISTRY Second Year

Comprise of two semester, i.e Semester III and Semester IV and in each semester, the candidate shall attain two papers and as such the candidate shall total 4 papers in second year.

SEMESTER -III

Paper-I

Biophysical Chemistry and Techniques related to Biochemistry

1. Acids, Bases, Buffer system in living body - pH – Handerson Hasselbalch equation, effect of pH on biological processes - Buffer solutions for biological investigations - methods of pH maintain working principles of a pH meter.
2. Osmosis and Osmotic pressure - Osmomolarity of body fluids
3. Distribution of fluids in body compartments.
4. Surface tension and viscosity - their application to human body in relation to normal life and disease processes.
5. Diffusion and absorption mechanisms - their application to biological systems.
6. Thermodynamics of the hydrolysis of ATP - binding of oxygen to hemoglobin and myoglobin - binding to multiple identical and independent sites.
7. Centrifugation techniques - Principles - differential centrifugation - Density gradient centrifugation - ultra centrifuge and its application in biological systems.
8. Chromatographic techniques - Principles types of chromatographic techniques like column, thin layer, paper, adsorption, partition, gas liquid ion exchange, affinity, high. performance - their applications in biological systems.
9. Principles and techniques of photometry and Colorimetry - Laws of light absorption - visible and u v Spectrophotometry - Spectrofluorimetry - Flame photometry atomic absorption spectrometry.

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10. Principles, instrumentation, techniques and applications of electron spin resonance, Nuclear Magnetic resonance, crystallography Mass spectrometry.
11. Principles of radioactivity, nature and types - decay rate radioactive decay - units of radioactivity - detection and measurement, of radio activity - radiation hazards and its prevention applications of radio activity and radio isotopes in biological systems.
12. Electrophoresis - Principles, types and their applications in biological systems.

Paper-II

Foods, Human Nutrition and Dietetics foods:

1. **Introduction of food science** - food groups providing nutritive requirements for normal health - basic four, basic five and basic seven food groups - preliminary preparation of food prior to cooking with special reference to conservation of nutrients and palatability - moist and dry heat methods of cooking foods - physical and chemical changes during cooking with special reference to nutritional components, color, texture, flavour and appearance of foods.
2. Study of foods - cereals and cereal products - pulses and nuts - vegetables and fruits - milk and milk products, flesh foods - eggs beverages - fats and oils - sugars - spices and flavours - their composition nutritive values storage - ripening and aging - preservation - changes occurring during food processing - food toxins.
3. Food fads - food fadism - effects of processing and preparation on the nutritive value of foods - food additives and contaminants - establishing the safety of food additives.
4. Nutrification of food - nutrient needs and allowances nutrition policy - criteria for food nutrification.
5. **Human Nutrition and Dietetics:**
 - a. Emergence, scope and methodology of nutrition as science - Energy metabolism - Energy value of foods - direct and indirect calorimetry - respiratory quotient - Energy needs of the body - basal metabolism Calculation of total caloric requirements.
 - b. Concepts of adequate and balanced diet - recommended dietary allowances (RDA) protein efficiency ratio, biological value etc.

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- c. Food energy (carbohydrate, protein, fat) and individual nutrients (Vitamins and minerals) with special reference to
 - i. distribution in body and biochemical rate
 - ii. amount in ordinary foods
 - iii. digestion, absorption, transport, storage, disposal.
 - iv. requirements and recommended allowances and their modifications under stress.
 - v. effects of their deficiency and excesses
 - vi. incidence, etiology and prevention of diseases
 - vii. inter relation with other nutrients
6. Assessment of nutritional status of an individual and community.
7. Nutritional and food requirements to meet the needs of infants, preschool, school children, adolescents, adults, geriatric group pregnancy, and lactation.
8. Formulation of balanced diets, nutritional adaptation.
9. Common disorders of nutrition – under-nutrition - over nutrition - protein malnutrition, obesity, food allergy.
10. Diet therapy or formulation of therapeutic diets - purpose and principles of therapeutic diets with special reference to diabetes mellitus, renal disorders, diseases of liver, diseases of heart and circulatory system, obesity and leanness, atherosclerosis, hypertension, anemia, vitamin deficiencies, peptic ulcer, use of exchange lists.

List of Manual Practicals

1. Good Lab Practices
2. Preparation of Buffers
3. Measurement of pH
4. Chromatographic separation of amino acids using TLC
5. Estimation of Vitamin C in blood
6. Preparation of tissue homogenates

List of Semi-automated Practicals

1. Estimation of creatinine in blood
2. Estimation of Urea
3. Estimation of bilirubins, and hepato biliary function tests

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4. Estimation of uric acid
5. Estimation of Phosphorus

List of Automated Practicals

1. Estimation of copper in plasma/serum
2. Determination of basal and maximal acid output in gastric juice (Amylase)
3. Estimation of glycated hemoglobin

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SEMESTER- IV

Paper-I

Bio-Organic Chemistry and Bio-statistics

1. Carbohydrates: Occurrence, Chemical properties and Classification Stereo and optical isomerism. Monosaccharides: Structure, mutarotation, general reactions derivatives. Oligosaccharides: Structure and functions Homoglycans: Starch, glycogen, cellulose, insulin, dextrin, structural properties. Heteroglycans: Agar, pectins, aliginic acid - structure ant properties of mucopolysaccharides cell wall polysachharides - cell surface carbohydrates.
2. Lipids: Classification, physiochemical properties and structure of fatty acids, waxes, oils, triacylglycerols, phospholipids, glyco lipids, sterols, prostaglandins, thromboxanes, leukotuienes, bile acids - separation of lipids by various methods.
3. Heterocyclic systems, furans, pyran, thiazole, indole, imidzole, pyridine, pyrididine, purine, guinine, isoalloxasone, pteridine, corium compounds - porphyrins, classification, properties and structure - Heme, cytochromes.
4. Proteins: Classification, structure, physiochemical properties and reactions of amino acids, peptides, polypeptides membrane proteins, levels of organisation, synthesis of peptide bonds, peptide unit, denaturation, renaturation, coagulation, flocculation, precipitation methods of estimations, separation techniques, end group analysis-hemoglobins, cytochromes, collagen, immunoglobulins.
5. Nucleic acids and Nucleoproteins: Structure, isolation and functions of nucleosides, nucleotides, nucleoproteins, nucleic acids, DNA, RNA, Denaturation and hybridisation, biologically important nucleotides
6. Structure and functions, properties of antibiotics: Penicillins, streptomycin, chloromycetin, tetracyclines, chemotherapeutic agents antagonists to vitamins.
7. Biostatistics: Basic concepts of probability, mean, mode, medium, standard deviation, laws of chance, binomial expression, hard weinberglaw, 't' test, chi square - analysis of variance - co-efficient of correlation, evaluation of a new diagnostic procedure.

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- biochemical role, deficiency manifestations and toxic effects of water soluble and lipid soluble vitamins - antivitamins, pseudovitamins
14. Bioenergetics - Laws of thermodynamics and their application in biological systems - free energy change - entropy and enthalpy - thermodynamics of coupled reactions - high energy phosphates - their role in energy capture and transfer - redox potential enzymes involved in biological oxidation - components of respiratory chain - phosphorylation at the substrate level and respiratory chain level - inhibitors of biological oxidation - mechanism of energy capture - chemiosmotic theory - uncouplers of oxidative phosphorylation.

Practical

List of Manual Practicals

1. Reactions of carbohydrates, lipids, proteins, Vitamins A & C
2. TLC, DLC of blood, hemoglobin estimation, HCT, PCV
3. Estimation and qualitative analysis of casein and egg albumin
4. Determination of nitrogen content in biological samples
5. To assay enzyme salivary amylase in saliva
6. Determination of optimum pH and temperature of enzyme

List of Semi-automated Practicals

1. CSF analysis for biochemical parameters. Estimation of serum bilirubin
2. Estimation of Total Protein
3. Estimation of Total Cholesterol
4. Estimation of Triglyceride
5. Determination of phosphorus content of biological samples.

List of Automated Practicals

1. Estimation of iron and iron binding capacity in plasma/serum (Transferrin and Ferritin)
2. Estimation of Na, K, Ca⁺⁺ in blood

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BIOCHEMISTRY Third Year

SEMESTER-V

Paper-I

Intermediary Metabolism and Regulation

1. Introduction to methods of studying intermediary metabolism whole organism studies - whole animal, plant studies - perfusion of isolated organ-organ and tissue slice techniques isolated and cultured tissue and cell technique.
2. Intermediary metabolism of carbohydrates - glycolysis, glycogenolysis, glycogenesis, HMP shunt, uronic acid, glucoconeogenesis, common metabolic pathway, aminosugar, sialic acids, glycoproteins and proteoglycans, regulation of blood glucose, hormonal control of carbohydrate metabolism.
3. Lipid metabolism: Oxidation of fatty acids, degradation of complex lipids, biosynthesis of fatty acids, essential fatty acids, triacylglycerds, steroids, phospholipids, prostaglandins, cholesterol, bile acids, lipoproteins, glycolipids - regulation of lipid metabolism.
4. Protein and amino acid metabolism: Degradation of amino acids oxidative and non-oxidative deamination, transamination, decarboxoydation, detoxication of ammonia,
5. catabolism of carbon skeletons of amino acids - ketogenic and glucogenic amino acids -
6. nitrogen balance conversion of amino acids to specialised products.
7. Nucleic acid metabolism - Biosynthesis and degradation of purines and pyrimidine ring nucleotides - regulation of biosynthesis and degradation conversion to doxynucleot ides.
8. Metabolism of xenobiotics - detoxication mechanisms in the body biological implications of xenobiotic metabolism.
9. Mineral metabolism: macro, micro nutrients, daily requirements, sources, biochemical functions, regulation of intake, turnover and metabolism - disorders related to macro and micro mineral nutrients, calcium, phosphorus, iron, copper, zinc, magnesium, chromium, selenium, sodium and potassium.

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Paper-II

Cell and Molecular Biology

1. Introduction to cell biology - organization levels - cell theory - cell classification and variability.
2. General structure of prokaryotic and eukaryotic cells - mitosis - meiosis - method for studying cells and organelles - freeze fracture technique - specific staining of organelles/marker enzymes - sub cellular fractionation, ultracentrifugation, differential and density gradient centrifugation - cell cycle.
3. Cell and tissue culture techniques - contact inhibition, cancer, growth inhibitors, cell movement, communication between and within cells.
4. Cell differentiation - organogenesis, morphological functional and biochemical maturation of tissues, impact of environmental factors - structure and function of cell membrane and organelle membranes.
5. Structure, elements of cytoskeleton and its role in maintaining cell shape - erythrocyte and non erythrocyte cytoskeletons and their modes of interaction with membrane microvillar cytoskeleton - role of calcium - Behaviour of receptor coated vesicles - endocytosis.
6. Hydrophobic effect and organisation of lipids in micelles monolayers, bilayers, liposomes, motion of lipids and proteins in membranes - organisation of proteins in membranes, protein lipid interaction - assembly membrane flow cycling - targeting signals and adaptor proteins, membrane lipids - transport, different lipid components, flip-flop asymmetry of membranes, receptors - receptor mediated endocytosis.

Molecular Biology:

7. Nucleic acids as genetic information carriers - experimental evidence e.g. action spectrum, genetic information, Hershey-chase experiment etc.
8. Modes of replication, details of Meselson and Stahl experiment, semi conservative replication.
9. Physical properties of DNA - 5' - 3' direction, size range location, isolation, shear, base composition, base equivalent, gel electrophoresis, secondary structure, base pairing, base stacking, helix-coil transition, T_m and relationship to GC content, Tertiary structures.
10. Genetic code - Evidence for a triplet code, properties of the code - sequential, ubiquitous, degenerative, wobble hypothesis, nonsense codon, adapter role of tRNA, amino acyl tRNA synthetases, anticodon loop, direction of protein synthesis.
11. Mechanism of translation - A & P sites, N-blocked aaTRNAs - tmet RNA - initiator codon, shine - Dalgarno consensus sequence (AGGA) Formation

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- of 70S initiation complex - role of initiation factors and GTP, Peptidyltransferase, translocation, role of EF-Tu, EF-Ts, EF-G and GTP - Nonsense codons, role of RF1, RF2 and GTP.
12. Mechanism of transcription-sigma cycle, recognition, binding and initiation sites - TATA / Pribnowbox, enhancer and other regulatory elements - Direction of chain growth - termination rho and palindromes - Regulation of transcription of promoters and repressors - concept of operon.
 13. DNA replication - properties of DNA dependent DNA polymerases I, II, III and their role in DNA replication - Discontinuous/continuous synthesis - okazaki fragments - RNA primers, repairs of DNS polymerase and DNA lipase, role of DNA glyrase, unwinding enzyme, HD protein, polymerase chain reaction.
 14. Rates of eukaryotic and prokaryotic protein synthesis, multiple invitation sites, bidirectional replication, bubbler, fidelity of replication excision - repair systems, recombinant repair system, chemical carcinogenesis.
 15. DNA dependent RNA polymerase - in vitro assay-physical properties of the enzyme, subunit structure, proof of template directed synthesis.
 16. Post transcriptional processing-maturation of rRNA and tRNA-RNA splicing introns and exons - consensus sequence of junction - mechanism of RNA splicing-Poly A tail -5' capping-Non coding sequences etc - Introns and Protein functional domains.
 17. Post translational processing-signal hypothesis-Functions of pre and pro regions signalase - symogen activation.
 18. Rapid DNA sequencing techniques - details of methodologies eg. plus and minus dideoxynucleotide, partial ribosubstitution, Maxam and Guilbert - use of thin gels, resolution etc. interpretation of DNA sequences.
 19. Role of counterions, deep and grooves, SBS-DNA, A, B&Z DNA etc. chirality of the helix, syn/antiparallel complementary strands.
 20. Physical properties of RNA-classes of RNA-structure, methods of isolation and fractionation of RNA-primary, secondary and tertiary structures - DNases, RNases, phosphodiesterases etc.
 21. Rapid RNA sequencing techniques - plus and minus, dideoxynucleotide, Zimmern and Kaesberg, Paettie, Simonesites method et, interpretation of RNA sequences.
 22. Classes of DNA sequences - zero order binding, highly repetitive, unique methods of distinguishing double stranded and single stranded DNA - Reassociation kinetics, cot values, use of Ag⁺ cesium sulfate.
 23. Satellite DNA - possible functions - C value paradox-mechanical strength, gene library, suppressor mutation, centrometric DNA, split genes.
 24. Recombinant DNA technology and its applications, plasmids, cosmids as vehicles, isolation and characterization of DNA and fragmentation with

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restriction enzymes, ligation to vehicles, introduction of gene by transduction and transfection, selection of clones, DNA cloning-social and moral implications - international guidelines.

Practical

List of Manual Practicals

1. Qualitative analysis of normal and abnormal constituents of urine.
2. Principles of colorimetry and estimation of glucose in serum and blood using phenol-sulphuric acid method
3. To understand the principle of dialysis, surface tension, viscosity
4. Titration of a strong acid by base using a pH meter
5. Assay of enzyme alkaline phosphatase in serum
6. Determination of optimum pH and temperature of enzyme alkaline phosphatase

List of Semi-automated Practicals

1. Estimation of pentoses and Vit A, in blood/plasma.
2. Analysis of pH of blood in systemic acidosis and alkalosis
3. Estimation of ALP Estimation of HDL
4. Estimation of LDH Direct
5. Estimation of CK-Total

List of Automated Practicals

1. Estimation of SGOT and SGPT in serum
2. GTT estimation in serum/plasma

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SEMESTER -VI

Paper- I

Endocrinology and Immunity

1. Comparison of hormones and trace dietary substances, Endocrine and nerve integration - cell membrane and intracellular receptors for hormones-hormonal inter-relationships. Experimental approaches to endocrinology - Mechanism of hormone action - classification of hormones.

2. ENDOCRINOLOGY

- a. Hormones of the pituitary and hypothalamus - POMC peptide family. Hormones of the thyroid - iodine metabolism - biosynthesis of thyroid hormone structure, activity, metabolism - interaction with other endocrine systems - antithyroid drugs.
- b. Hormones regulating calcium metabolism - parathyromones, calcitriol, calcitonin, thesis, secretion, regulation.
- c. Hormones of the adrenal cortex - Glucocorticoids, mineralocorticoids and androgens - their biosynthesis, secretion, transport and metabolism and their metabolic effects.
- d. Hormones of adrenal medulla - catecholamines and their derivatives - biosynthesis, excretion, storage, regulation and metabolic effects - functional similarity between catecholamine receptor and visual response system.
- e. Hormones of the gonads - androgens, estrogens and progestins - structure, biosynthesis secretion, regulation, metabolic effects - transport - menstrual cycle - regulation.
- f. Hormones and endocrinology and pregnancy and lactation - fetoplacental unit.
- g. Hormones of pancreas - chemistry, biosynthesis, regulation, secretion of insulin, glucagon, somatostatin - effects of insulin and glucagon on carbohydrate, lipid and protein metabolism - synthetic hypoglycemic agents.

1. Endocrine disorders - Biochemical basis of the disorders related to all the above endocrine system under (2).

2. Immunology:

- Introduction to the cells and organs of immunity - memory, specificity, diversity, self vs non-self discrimination, structure and functions of

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primary and secondary - lymphoid organs - cell mediated versus humoral immunity - T and B lymphocytes.

- Infection: Types, factors influencing infection and harmful microbial products such as exotoxins and endotoxins, leukocidins, hemolysins, fibrinolysins-proof of pathogenecity and course of infection - sources of infectious agents and their carriers - portals of entry.
- The host response - Natural defense of the body, species, racial, communal, regional and individual variation - mechanism of natural resistance - the skin, mucus membrane, lysozyme, phagocytes, defences In blood, lymph and components of Reticulo endothelial system.
- Nature of antigen and antibody: antigen vsimmunogen - structure of antibody - constant and variable and hypervariable regions, Fat and F, isotype, allotype and idiotype - functions of antibody molecules, classification.
- Measurement of antigen-antibody interactions: Direct binding assays, agglutination, precipitation, immunodiffusion, immunoelectrophoresis, Elisa, RIA, fluorescence analysis, hybridoma technique.
- Generation of diversity in the immune response - immune tolerance at birth, in adult and termination of tolerance - instructive, selective and clonal selection theories - concept of antigen specific receptors, genes encoding antigen - specific receptors on T & B lymphocytes - genetic rearrangement - class switch.
- Antigenecity: Definition - flagellar, somatic, capsular, soluble, heterophilic and auto antigens - blood groups and blood group antigens - tissue antigenic determinations.
- Central role of major histocompatibility complex (MHC) genes and products in immune response - associated MHC functions - allograft, autograft, graft vs host and mixed leukocyte response transplantation and immune response.
- Complement - complements of classical and alternate pathways hypersensitivity Types I, II, III and IV responses - immune responses to parasites and tumors.
- Immunodeficiency, auto immunity - Monoclonal cloning and related methodologies.

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Paper-II

Clinical Biochemistry

1. Role of biochemistry in diagnosis of diseases.
2. Gastrointestinal tract - Acidity curves, qualitative and quantitative analysis of gastric contents and duodenal contents Pancreatic disorders in relation to exocrine function - malabsorption syndromes - laboratory parameters useful in diagnosing diseases of GT Tract.
3. Hepatobiliary system - Hepatobiliary function tests - lab findings and differential diagnosis of jaundice - metabolism of bilirubin - cirrhosis, hepatic coma, hepatitis, gall stones, cholecystitis and tumors.
4. Excretory system - Renal function tests - Biochemical changes and laboratory findings in acute and chronic renal failure - clearance of tests - urinary calculi, renal hypertension - principles of peritoneal and hemodialysis - urinalysis for normal and abnormal constituents.
5. Disorders of carbohydrates metabolism - Glucose level in normal blood, renal threshold, hyper and hypoglycemia and glycosuria - qualitative tests for sugars in urine - intravenous and other types of glucose tolerance tests - fructose levels in blood lab diagnosis of early and latent diabetes mellitus - diabetic coma, secondary degenerative changes associated with diabetes mellitus - Glycogen storage disorders.
6. Disorders of nitrogen metabolism - Assimilation and excretion of nitrogen with reference to ammonia, urea, uric acid, creatine, creatinine - excretion of nitrogenous waste products - abnormalities of nitrogen metabolism including uremia, porphyrias, porphyrinurias, aminoaciduria - factors affecting nitrogen balance.
7. Disorders of lipid metabolism - Plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, ketosis, fatty liver.
8. Blood and coagulation - disturbances of blood clotting mechanisms - systematic analysis of hemorrhagic disorders - coagulation and prothrombin time, determination - hemoglobin-anemia - abnormal hemoglobins and their identification.
9. Mineral metabolism - Laboratory findings in disorders related to iron, copper, iodine, calcium, phosphorus, magnesium and zinc and their importance in health and disease. Cerebrospinal fluid - Composition in normal and diseases - laboratory findings of CSF constituents in health and disease.
10. Inherited disorders of metabolism: Changes occurring in phenyl

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ketonuria, alkaptonuria, tyrosinosis, albinism, Hartnup's disease, galactosemia. Tay-Sach's disease, Niemann Pick's disease, Hunter's and Hunter's syndrome, Lys-Nyhan syndrome - detection of these anomalies.

11. Clinical Enzymology - Laboratory investigations on serum and urine for constituents (normal & abnormal) of diagnostic and prognostic importance. Plasma specific and non plasma specific enzymes of diagnostic prognostic importance and their interpretation of amylase, aminotransferase, phosphatases, creatinine kinase, cholinesterases, lactate dehydrogenase, phosphohexoseisomerase, lipoprotein lipase.
12. Acid base balance - coagulation of blood pH within normal range disturbances in acid base balance - acidosis, alkalosis, mixed disturbances - laboratory parameters - blood gas analysis.
13. Fluid and electrolyte balance - regulation - disturbances of fluid and electrolyte balance - laboratory parameters in the diagnosis and management of fluid and electrolyte disorders - oral rehydration therapy.

Practical

List of Manual Practicals

1. Electrophoretic separation of plasma/serum proteins.
2. DNA isolation from cells and its visualization using AGE
3. To draw a calibration curve for estimation of BSA by Folin-Lowry method
4. Estimation of proteins in blood-serum by Folin-Lowry method

Text Books recommended

1. Harper's Review of Biochemistry - Ed By David Martin et al Lange Medical Publications Latest
2. Biochemistry by Lehninger
3. Biochemistry by Stryer
4. Text book of Clinical Chemistry by Norbert Tietz- 1986 W.B. Saunders Co., Latest.

Practical Books recommended

1. Practical Manual of Experiments in Biochemistry - Department of Biochemistry, era's medical college and hospital
2. Practical Clinical Chemistry by Varyley H. Vol. I and II. Latest.

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3. Methods in Enzymology - Colowich and N.O. Kaplan Academic Press
11 volumes.
4. Clinical Biochemistry by E.J. King and IDP Woo Church Hill and Co.
5. Fundamentals of Clinical Chemistry - Edited by Norbert W. Tetz. Pub:
W.B. Saunders Company. Latest.
6. Practical Clinical Biochemistry (5th Edition) or Vol. I and II
Herold Varley et al. Publisher: Arnold - Heinemann/ Latest.

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