

PERIYAR UNIVERSITY

SALEM

B.Sc., BIOCHEMISTRY

(CBCS SYLLABUS)

(For candidates admitted from 2008-09 onwards)

SCHEME OF EXAMINATION

SEMESTER	PART	COURSE	TITLE OF THE PAPER	DURATION	MARKS
I	I		Tamil I	3	100
	II		English I	3	100
	III	Core I	Bio-organic chemistry	3	100
		Allied I	Allied Chemistry	3	100
		SBEC I	pharmaceutical biochemistry	3	100
		VAL EDU		3	100
II	I		Tamil II	3	100
	II		English II	3	100
	III	Core II	Tools of biochemistry	3	100
		Allied II	Allied Chemistry	3	100
		Core practical I	Core practical I	6	100
		Allied practical I	Allied practical I	3	100
		Environ., Science	Environmental Studies	3	100
III	I		Tamil III	3	100
	II		English III	3	100
	III	Core III	Enzymes	3	100
		Allied III	Biostatistics	3	100
		SBEC II	Plant biochemistry and Medicinal Plants	3	100
		NMEC I		3	100
IV	I		Tamil IV	3	100
	II		English IV	3	100
	III	Core IV	Intermediary metabolism	3	100
		Allied IV	Computer application in biology	3	100
		Core practical II	Core practical II	6	100
		Allied practical II	Allied practical II	3	100
		NMEC II		3	100
V		Core V	Clinical biochemistry	3	100
		Core VI	Molecular biology	3	100
		Core VII	physiology	3	100
		Elective I	Biomedical Instrumentation	3	100
		SBEC III	Genetic engineering	3	100
		SBEC IV	Clinical pathology	3	100
VI		Core VIII	Immunology	3	100
		Core IX	Endocrinology	3	100
		Elective II	Nutritional biochemistry	3	100
		Elective III	Microbial biochemistry	3	100
		SBEC V	Basic bioinformatics	3	100
		SBEC VI	Industrial biochemistry	3	100
		Core practical III	Core practical III	6	100
		Core practical IV	Core practical IV	6	100

TOTAL MARKS -4000

Course of study

SEMESTER	PART	COURSE CODE	COURSE	Hrs		CREDIT	MARKS		
I				Lecture	T/P		CIA	EA	TOTAL
	I	08UFTA01	Tamil I	6		3	25	75	100
	II	08UFEN01	English I	6		3	25	75	100
	III	08UBC01	Bio-organic chemistry	4		5	25	75	100
		08UCA01	Allied I	5		4	25	75	100
		08UBCP01	Core practical I	2		-	-	-	-
		08UCAP01	Allied practical I	2		-	-	-	-
		SBEC I	pharmaceutical biochemistry	2		2	25	75	100
			Environ.,Science	1		-	-	-	-
			Val EDU	2		2	25	75	100

SEMESTER	PART	COURSE CODE	COURSE	Hrs		CREDIT	MARKS		
				Lecture	T/P		CIA	EA	TOTAL
II	I	08UFTA02	Tamil II	6		3	25	75	100
	II	08UEN02	English II	6		3	25	75	100
	III	08UBC02	Tools of biochemistry	6		5	25	75	100
		08UCA02	Allied II	5		3	25	75	100
		08UBCP01	Core practical I	3		3	40	60	100
		08UCAP01	Allied practical I	3		3	40	60	100
		08UES01	Environ.,Science	1		2	25	75	100

SEMESTER	PART	COURSE CODE	COURSE	Hrs		CREDIT	MARKS		
				Lecture	T/P		CIA	EA	TOTAL
III	I	08UFTA03	Tamil III	6		3	25	75	100
	II	08UFEN03	English III	6		3	25	75	100
	III	08UBC03	Enzymes	6		5	25	75	100
			Allied Biostatistics	5		3	25	75	100
		08UBCP02	Core practical II	3		-	-	-	-
		08UBCS02	Plant biochemistry	2		2	25	75	100
		NMEC	NMEC I	2		2	25	75	100

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SEMESTER	PART	COURSE CODE	COURSE	Hrs		CREDIT	MARKS		
				Lecture	T/P		CIA	EA	TOTAL
V		08UBC05	Clinical biochemistry	5		5	25	75	100
		08UBC06	Molecular biology	5		5	25	75	100
		08UBC07	physiology	5		5	25	75	100
		08UBCE01	Biomedical Instrumentation	5		5	25	75	100
		08UBCS03	Genetic engineering	2		2	25	75	100
		08UBCS04	Pathology	2		2	25	75	100
		08UBCP03	Core practical III	3		-	-	-	-
		08UBCP04	Core practical IV	3		-	-	-	-

SEMESTER	PART	COURSE CODE	COURSE	Hrs		CREDIT	MARKS		
				Lecture	T/P		CIA	EA	TOTAL
VI		08UBC08	Immunology	5		5	25	75	100
		08UBC09	Endocrinology	5		5	25	75	100
		08UBCE02	Nutritional biochemistry	5		5	25	75	100
		08UBCE03	Microbial biochemistry	5		5	25	75	100
		08UBCS05	Basic bioinformatics	2		2	25	75	100
		08UBCS06	Industrial biochemistry	2		2	25	75	100
		08UBCP03	Core practical III	3		4	40	60	100
		08UBCP04	Core practical IV	3		4	40	60	100
			Extension activity		-	1	-	-	-
				180		140	1090	2910	4000

PAPERS GIVEN BY THE BOARD AS NON –MAJOR ELECTIVE COURSE

SEMESTER –III

BIOCHEMISTRY IN DIAGNOSIS

CLINICAL NUTRITION

SEMESTER -IV

CELL BIOCHEMISTRY AND HUMAN PHYSIOLOGY

BIOCHEMISTRY AND HEALTH

SEMESTER I**CORE COURSE -I****BIO-ORGANIC CHEMISTRY****UNIT-I**

Carbohydrates: Introduction, classification, monosaccharide-structure, stereo isomers and structural isomers, mutarotation, and chemical reactions. Oligosaccharides-Dissaccharides -structure and importance of sucrose, Lactose, maltose, cellobiose. Polysaccharides-structure and importance of homopolysaccharides and heteropolysaccharides.

UNIT-II

Amino acids and Proteins: Amino acids-classification, structure and properties. Protein classifications and properties. Primary, secondary, tertiary structure of Proteins.

UNIT-III

Lipids: Introduction classification physical properties, and chemical properties of fats and oils. Structure and importance of saturated and unsaturated fatty acids, phospholipids and sterols

UNIT-IV

Nucleic acids: Introduction, chemistry of nucleic acids, nucleoproteins, double helical structure and properties of DNA, RNA –types structure and functions

UNIT-V

Vitamins: Introduction Structure ,properties, functions and deficiency diseases of fat soluble and water soluble Vitamins.

RECOMMENDED BOOKS

- Lehninger's Principles of Biochemistry (2000) by Nelson, David l. and Cox, M.M. Macmillan/ worth,.NY
- Fundamentals Of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY
- Biochemistry 3rd (1994) by lubert stryer, W H freeman and co, Sanfrancisco.
- Biochemistry 4th edition (1988) by Zubay G L , W M C Brown Publishers.
- Principles of Biochemistry (1994) Garrette & Grisham, Saunders college publishing
- Outlines of Biochemistry (1987) by Eric E.Conn, P.K. Stumpf, G.Brueins and Ray H.Doi, John Wiley & Sons, NY
- Text book of biochemistry (1997) 4th edition Thomas M devlin, A John Wiley, Inc publication, New york.

SKILL BASED ELECTIVE COURSE - I**PHARMACEUTICAL BIOCHEMISTRY****UNIT I**

Drugs: History of Drugs Classification of drugs, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs.

UNIT II

Drug-Receptor interactions involvements of binding forces in drug receptor interaction, drug action not mediated by receptors.

UNIT III

Drug metabolism: Mechanism of phase I and II enzyme reactions, biochemical importance of xenobiotic metabolism.

UNIT IV

Cancer: Cancer and principles of cancer chemotherapy, mode of action of anti cancer drugs, antimetabolites, antibiotics, alkylating agents and other agents,

UNIT V

Adverse drug reactions and drug induced side effects, biological effects of drug abuse and drug dependence, drug tolerance and intolerance.

RECOMMENDED BOOKS

- The Pharmacology volume I and II –Goodman and Gillman
- Basic Pharmacology –Foxter Cox
- Oxford text book of Clinical Pharmacology and Drug Therapy ,D.G Grahme Smithand J.K.Aronson
- Pharmacology and Pharmatherapeutics – R.S.Satoskar,S.D.Bhandhakarand
- Essentials of Pharmacotherapeutics ,Barav.F.S.K
- Lippincotts illustrated review Pharmacology ,Mary.J.Mycek,Richards ,Pamela

SEMESTER II
CORE COURSE –II
TOOLS OF BIOCHEMISTRY

UNIT-I

General principles of Biochemical investigation ,in vivo and invitro studies-organ and tissue slice techniques,buffer solution and media for tissue homogenization and separation ,methods of cell disruption ,basic principles of cell culture ,cryopreservation ,cell sorting ,counting.

UNIT-I

Centrifugation techniques: Basic principles of sedimentation, types of centrifugation, types of centrifuges. Types of rotors-swinging bucket fixed angle, vertical tube and zonal rotor. Differential and density gradient centrifugation with applications

UNIT-III

Chromatographic techniques: Principles, materials, sample preparation, methods and applications of paper, column, ion exchange, gel filtration , affinity chromatography, GLC,TLC & HPLC.

UNIT-IV

Electrophoresis techniques: Principles techniques and applications of agarose, PAGE,SDS-PAGE, cellulose acetate ,capillary electrophoresis, isoelectric focusing ,Factors affecting electrophoresis

Colometric and spectroscopic techniques: Beer - Lambert's law, light absorption and its transmittance, principle instrumentation and applications in enzyme assay and kinetic assay, protein and nucleic acid structural studies.

UNIT-V

Radioisotopic techniques: Atomic structure, types of radioactive decay ,negatron, positron, alpha particle and gamma particle ,rate of radioactive decay, units of radioactivity ,detection and measurement of radioactivity based on ionization ,excitation properties and autoradiography and its applications.

RECOMMENDED BOOKS

- Principles and techniques of practical Biochemistry,Keith Wilson and John Walker,1995.Cambridge University Press.
- An Introduction to Spectroscopy for Biochemist, Brown. SB Academic Press.
- Introduction to Centrifugation, Ford T.C and Graham J.N., Bioscientific Publishers Ltd, Oxford.
- Biophysical chemistry Principles and Techniques- Avinash Upadhyaye and Nirmalendhe Nath , Himalaya Publishers.
- A Biologist Guide to Principles and Techniques of Biochemistry , Keith Wilson and Kenneth Goulding, Edward Arnold publishers
- Tools of Biochemistry David Cooper

CORE PRACTICAL – I

I. Preparation of Buffers and Determination of pH

II. Qualitative Analysis.

- a. Analysis of carbohydrates
- b. Analysis of Aminoacids
- c. Test for proteins
- d. Test for lipids – cholesterol

III. Biochemical preparation

- a. Starch from Potato
- b. Casein from milk
- c. Lecithin from egg yolk

IV. Quantitative Analysis

- a. Reducing Sugar – Benedict's method
- b. Amino acid – formal titration
- c. Determination of Acid Number
- d. Determination of Saponification Number.
- e. Ascorbic acid – using 2,6 Dichloro phenol Indophenol method.

V. Techniques

- a. Separation of sugar & amino acid by Ascending paper chromatography
- b. Separation of lipid by thin layer chromatography
- c. Separation of plant pigments by column chromatography
- d. Separation of serum proteins by paper electrophoresis.

SEMESTER III
CORE COURSE –III
ENZYMES

UNIT-I

Enzyme : Introduction , IUB Classification and nomenclature of enzymes , holoenzymes ,apo enzymes , coenzymes ,cofactors ,prosthetic group ,activators , inhibitors . Definition and examples of metalloenzymes and metal activated enzymes.

Active site –Characteristics, theories of ES complex –Lock and key, induced fit and substrate strain theory.

Monomeric enzymes ,Oligomeric enzymes –definition with examples ,multienzymes complex ,enzyme specificity and enzyme units.

UNIT-II

Enzyme Kinetics-, MM Equation, LB Plot, Eadie Hostsee Plot , Hanes Plot, . Factors affecting enzyme activity. Isoenzymes – definition, LDH & CPK, diagnostic importance of isoenzymes.

UNIT-III

Coenzymes – definition , structure and functions of TPP , Nicotinamide, FMN , Coenzyme A , Lipoic acid, Biotin & Folate (Mechanism not required)

Mechanism of action of chymotrypsin & lysozyme. Enzymatic catalysis, Acid base catalysis, Covalent catalysis, Metal ion catalysis.

UNIT-IV

Enzyme inhibition – Reversible inhibition, Competitive, Non competitive & Uncompetitive inhibition. Irreversible inhibition , Feedback inhibition. Allosteric enzymes- properties, types, models, Aspartate transcarbamoylase.

Covalent modification.

UNIT-V

Methods for isolation & purification , criteria of purity. Immobilised Enzymes- methods & applications.

RECOMMENDED BOOKS

- Enzymes By Dixon , E.C Webb, CJR Thorne and K.F. Tipton, Longmans , London.
- Fundamentals of Enzymology 2 ed., (1998) By Nicholas C.Price, Lewis Stevans, Oxford University Press, First Edition (1990).
- Understanding Enzymes, Trevor Palmer, Ellis Horwood Limited, Third Edition(1991).
- Protein Biotechnology, Gary Walsh and Denis Headon, John Wiley and Sons,1994.
- Protein Biochemistry and Biotechnology, Gary Walsh and John Wiley and Sons Ltd.2002.
- Enzyme kinetics and Mechanism –Paul F.Cook

SKILL BASED ELECTIVE COURSE- II

PLANT BIOCHEMISTRY AND MEDICINAL PLANTS

UNIT- I

Plant cell – Structure and functions of subcellular organelles, plant cell wall, Mechanism of water absorption, Ascent of sap. Transpiration - types, stomatal opening, Mechanism and factors affecting transpiration.

UNIT-II

Photosynthesis – Photosynthetic pigments, Photo synthetic apparatus, Light reactions, cyclic and non cyclic phosphorylation. Calvin cycle, Hatch – Slack cycle, CAM plants. Regulation of photosynthesis, Photorespiration.

UNIT-III

Cycles of elements – Nitrogen cycle, Biochemistry of symbiotic and non symbiotic nitrogen fixation, Sulphur cycle, Phosphorus cycle. Plant nutrition – Biological functions of micro and macro nutrients in plants and their deficiency symptoms.

UNIT – IV

Plant growth regulators – chemistry, biosynthesis, mode of action, distribution and physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene. Biochemistry of seed dormancy, Seed germination, Fruit ripening and Senescence.

UNIT- V

Medicinal value of different parts of plants. Basic methods to identify the secondary metabolites. Role of secondary metabolites in Ayurvedha and Sidha treatment. Medicinal value of Amla, Stevia, Aswagandha and Turmeric.

RECOMMENDED BOOKS

- Plant physiology, Verma, 7th Revised edition, Emkay Publications 2001.
- Plant Physiology, S. N. Pandey and B.K. Sinha, Vikas Publishing House Pvt. Ltd, 3rd edition, 1999.
- Plant Biochemistry and Molecular Biology, Peter Jhea, Richard C. Leegood,
- Introduction to plant physiology, William. G.Hopkins, Norman. P.A. Hunger, 3rd edition
- A Handbook of Medicinal Plants –Prajapathi, Purohit, Sharma, Kumar
- Medicinal Plants –a compendium of 500 species.
- Medicinal Plants –Chopra, Khana, Prasad, Malik, Bhutiani.

SEMESTER IV
CORE COURSE –IV
INTERMEDIARY METABOLISM

UNIT-I

Carbohydrate metabolism: Introduction , glycolysis ,TCA cycle , and its energy production. Glycogen metabolism : Glycogenesis & Glycogenolysis ,Alternative pathways: HMP pathway , gluconeogenesis , glucuronic acid pathway , glyoxylate cycle and its importance.

UNIT-II

Lipid metabolism: Introduction , biosynthesis & degradation of fatty acids (alpha , beta , omega oxidation) . Degradation of lipids ,Biosynthesis of cholesterol and TG , Metabolism of ketone bodies .

UNIT-III

Protein metabolism : Degradation of proteins – Deamination , Transamination & Decarboxylation . Transport of ammonia. Urea cycle. Ketogenic & Glucogenic amino acids

UNIT-IV

Biological oxidation : Introduction , Enzymes in biological oxidation , Redox potential , Mitochondrial E.T.C. & its inhibitors , structure of ATPase complex , chemiosmotic theory , Oxidative phosphorylation & its inhibitors , Mitochondrial shuttle system

UNIT-V

Nucleic acid metabolism : Introduction , Biosynthesis & degradation of purine and pyrimidine nucleotides , inhibitors of nucleic acid metabolism .

RECOMMENDED BOOKS

- Fundamentals of Biochemistry, J.L. Jain, S.Chand publications, 2004.
- Harper's Biochemistry Robert K. Murray , Daryl K. Granner , Peter A. Mayes , Victor W. Rodwell, 24th edition , Prentice Hall International. Inc.
- Principles of Biochemistry , Geoffrey L. Zubay , 3rd edition William W. Parson, Dennis E. Vance, W.C. Brown Publishers, 1995.
- Principles of Biochemistry, David L. Nelson , Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.
- Biochemistry, Lubert Stryer , 4th edition, W.H. Freeman & Co, 1995.

CORE PRACTICAL II

I COLORIMETRY

1. Estimation of glucose – O T Method
2. Estimation of fructose –Seliwanoff's Method
3. Estimation of Pentose – Bial' s Method
4. Estimation of Protein – Biuret Method
5. Estimation of Urea – DAM Method
6. Estimation of Cholesterol – Zak's Method
7. Estimation of Phosphorus – Fiske Subbarow Method.

II ENZYME ASSAY

Determination of activity, effect of pH, effect of temperature and substrate concentration of

- a. Salivary Amylase
- b. Urease
- c. Acid phosphatase
- d. Alkaline phosphatase

SEMESTER V**CORE COURSE V****CLINICAL BIOCHEMISTRY****UNIT – I**

Approaches to clinical biochemistry: Concepts of accuracy, precision, sensitivity and reproducibility, quality control, fixation of normal range. Collection and processing of samples, anticoagulants, preservatives for blood and urine, transport of biological samples.

UNIT – II

Disorders in carbohydrate metabolism: Introduction, blood glucose regulation, hypo and hyperglycaemia, renal threshold value. Diabetes mellitus : Types, Clinical features, metabolic effects, complications, GTT, galactosaemia, fructosuria, and glycogen storage diseases.

UNIT – III

Disorders in protein metabolism: Introduction, aetiology and clinical features of phenylketonuria, alkaptonuria, cystinuria, albinism and tyrosinemia, clinical significance of non – protein nitrogen – urea, uric acid and creatinine. Metabolism of bilirubin, types of jaundice and its clinical features.

UNIT – IV

Disorders in lipid metabolism: Introduction, hypertriacylglyceridemia, atherosclerosis – aetiology, clinical features and complication. Lipid storage diseases, fatty liver. Disorders in nucleic acid metabolism: Gout, types, aetiology and clinical features.

UNIT – V

Liver function tests: Detoxification and excretory function. Renal function test: Urea clearance and its interpretation. Enzymology: Clinical significance of SGOT, SGPT, ALP, ACP, CPK and LDH.

RECOMMENDED BOOKS

- Text book of medical Biochemistry, M.N. Chatterjee and Rane Sinde
- Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. John Wiley-Liss Inc. Publication
- Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.
- Principles of Internal Medicine, Harrison T.R. Fauci, Braunwald, Isselbacher 14th edition, MC-graw hill, Newyork. Volume I and II
- Tietz Fundamentals of Clinical Chemistry- (5th edition) C.A. Burtis, E.R. Ashwood (eds) Saunders WB Co.

CORE PAPER-VI

MOLECULAR BIOLOGY**UNIT – I**

Cell: Structural organization of prokaryotes and eukaryotic cells and its functions, physical and chemical structure of DNA, DNA as genetic material, properties, organization of DNA, special base sequences, left handed DNA helices, structure of RNA.

UNIT- II

DNA replication: Semiconservative replication, experimental evidence for semiconservative replication, replication in prokaryotes and eukaryotes, enzymes involved in replication, mechanism of replication, inhibitors of DNA replication. DNA damage and repair, types of mutation

UNIT – III

Transcription: Basic features of RNA synthesis, E.Coli RNA polymerases, initiation, chain elongation and termination of transcription, types of RNA and their processing.

UNIT- IV

Translation: Genetic code and its features, tRNA and amino acyl tRNA synthetases. Initiation, elongation and termination of translation, post translational modifications. Differences in protein synthesis between prokaryotes and eukaryotes.

UNIT – V

Regulation of gene expression: General aspects, operon model in prokaryotes – lac operon, tryp operon and arab operon

RECOMMENDED BOOKS

- Molecular biology, 3rd edition, Herylodish et al
- Genes – IX , Benjamin Lewin, Oxford University
- Concept of Genetics, 4th edition, William S. Klug and Micheal R. Cummings.
- Genetics, Peter J. Russell, 4th edition, Harper Collins College Publishers.
- Molecular biology of gene, James D. Watson, Nancy H.Hopkins, Jeffrey W. Roberts, Joan Argetsinger Steitz, Alan M. Weiner, 4th edition, The Benjammin Cummings Publishing Company, Inc. 2002

CORE COURSE VII
HUMAN PHYSIOLOGY

UNIT –I

Digestive System: Secretions of digestive tract, digestion, absorption, assimilation of carbohydrates, proteins, fats, nucleic acids, vitamins and minerals.

UNIT – II

Respiratory System: Transport and exchange of gases between lungs and tissues, Blood composition, function, mechanism of blood coagulation.

UNIT – III

Muscles: Types, functions and physiology of muscle contraction, physiology of cardiac muscle, cardiac cycle and the regulation of heart pumping, E.C.G, and blood pressure

UNIT – IV

Anatomy of kidney: Mechanism of urine formation, outline of structure and function of the male and female reproductive organs, spermatogenesis, menstrual cycle, physiology of pregnancy, parturition and lactation.

UNIT – V

Neuron structure: Synaptic transmission, classification of nervous system, characteristics of sympathetic and parasympathetic function.

RECOMMENDED BOOKS

- Human Physiology, Chatterjee.C. 11th edition Medical agency allied, Calcutta.
- Text book of medical physiology, A.C. Guyton 10th edition.
- Human body, Atlas, Publication Garden cheers
- Mammalian Biochemistry, White handler smith
- Review of medical physiology, William. F. Ganong, 14th edition, A Lange Medical book.

ELECTIVE COURSE -I

BIOMEDICAL INSTRUMENTATION

UNIT I

Classification of Biomedical Equipment, Diagnostic, therapeutic and clinical laboratory equipment. Introduction, types, merits, demerits, limitations, diagnostic and therapeutic application of endoscope, laparoscope and cardio scope. Transducers for biomedical application. Types, properties, characteristics and selection of transducers for biological instrumentation

UNIT I

Bioelectric signals and their recording, Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bioelectrodes, electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EMG

UNIT III

Biosensor-mechanism and types. Autoanalyser- types and application. Automatic tissue processing and application of microtome. Pulse oximetry – Introduction, principle and clinical application of sphygmomanometer. Magnetic resonance imaging system, basic NMR components and its application in medicine.

UNIT IV

Heart rate measurement pulse rate measurement, respiration rate measurement, blood pressure measurement, X-Ray Machine Basic X-Ray components, types of X-ray machines e.g. general purpose, dental image intensifier system, table shooting and maintenance of X-Ray machine

UNIT V

Therapeutic instruments. Introduction, types, life time, classification, power source and electrodes of cardiac pacemaker. Application of surgical diathermy equipment and haeme dialysis in medicine. Computer application in medicine- computerized catheterization laboratory, computerized patient monitoring system.

- Medical electronics and instrumentation by Sanjay Guha.-andbook of medical instruments by R.S Khandpur.
- Hand book of Medical instruments by R.S. Khandpur –TMH, New Delhi
- .Biomedical instrumentation by Cromwell Prentice Hall of India, New Delhi
- Medical instrumentation by John G.Webster-John Wiley.
- .Principles of applied Biomedical instrumentation by Goddes and Baker-John Wiley.
- .Biomedical instrumentation and measurement by Carr and Brown-Pearson.
- Introduction to Biomedical electronics by Edwand J. Bukstein –sane and Co. Inc. USA

SKILL BASED ELECTIVE COURSE–III**GENETIC ENGINEERING****UNIT-I**

Introduction to genetic engineering: Basic steps of gene cloning, enzymes used in genetic engineering.

UNIT-II

Cloning vectors: Plasmids, Phages, Cosmids, Phagemids, Yeast vectors, Shuttle vectors, Ti Plasmids, Ri plasmids.

UNIT-III

Methods of gene transfer. Isolation and purification of cellular and plasmid DNA, Methods for labeling nucleic acids and probes. Methods of DNA sequencing.

UNIT-IV

Amplification of DNA by PCR technique and applications, insitu hybridization, analysis of DNA, RNA and protein by blotting techniques, Marker and Reporter genes.

UNIT-V

Applications of genetic engineering: Transgenic plants and animals, commercial applications, gene therapy.

RECOMMENDED BOOKS

- Principles of gene manipulation, Old and Primrose, Blackwell Science.
- Genetic engineering and its applications, P. Joshi, Botania Publishers and Distributors.
- Recombinant DNA: A short course, Watson et al, Scientific American Books
- Gene Cloning and DNA analysis, T.A Brown, Blackwell Science Publishers, 2001.
- Biotechnology Fundamentals and Applications, S.S. Purohitt, Agrobios Publishers, 2001.

SKILL BASED ELECTIVE COURSE -IV**CLINICAL PATHOLOGY****Unit I**

Components of the blood (Plasma and Cellular elements) and their functions – Haemopoietic system of the body (Leucopoiesis, erythropoiesis and thrombopoiesis). Haemogram - Haemoglobin, PCV, ESR, RBC count, WBC count, Platelet count, Calculations of Anaemia using MCH, MCV & MCHC, Reticulocyte count, Absolute Eosinophil count, Differential count.

Unit II

Coagulation system- recalcification time, activated partial thromboplastin time and thrombin time, Clotting time, Bleeding time, Prothrombin time, Partial Prothrombin time.

Osmotic fragility – Heinz body preparation, Blood parasites, Cell preparation – Cytochemical tests, Quality control and quality assessment.

Unit III

Collection and physical examination: Collection of urine, Types of preservative, physical examination; Volume, colour, odour, appearance, specific gravity and pH.

Chemical examination: Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Roth's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test.

Microscopical Examination: Microscopic examination, identification of casts, crystals and blood cells- RBC, WBC, SE epithelial cells, smear for gram staining and urine culture.

Unit IV

stool examination: Collection of fecal specimen, preservation, physical examination; volume, colour, odour and appearance. Chemical examination; reducing sugar, occult blood test Determination of fat in stool and detection of steatorrhea.

Microscopic Examination of Feces: Concentration method, direct centrifuge floatation method and ether extraction method for ova and cysts. identification of crystals, meat fibers, fat globules and blood cells. Culture especially for enriched group of organisms.

Unit V

Tissue processing-processing of histological tissues, dehydration, clearing, wax preparation, paraffin embedding and embedding media, decalcification and block preparation. **Microtomes**- various types, their working principle and maintenance. Microtomes knives and knife sharpening procedure, practical section cutting, cutting fault and remedies.

Staining preparation-preparation of slide, deparaffinization and routine staining procedures, Identification and Demonstration of different metabolic compounds, mounting and mounting media.

RECOMMENDED BOOKS

- Sabitri sanyal-(1991):Text book of pathology, first edition,
- June H.cella- (1994): manual of laboratory test , AITBS publishers.
- Kanai L.Mukherjee,Medical Laboratory Technology Vol. I.Tata McGrawHill 1996,New Delhi.
- Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I
- SabitriSanyal, Clinical pathology, B.I.Churchill Livingstone(P)Ltd, New Delhi.2000.
- Judith Ann Lewis, Illustrated guide to diagnostic tests-students version,Springhouse Corporation, Pennsylvania, 1994.

CORE COURSE –VIII

IMMUNOLOGY

UNIT-I

Introduction to immunology: Immunity, types, mechanism of immunity, immune response, types, cells involved in immune response.

UNIT-II

Antigens: Properties, Specificity, Immunogenicity, antigenic determinants, haptens, adjuvants. Antibodies: Properties, Structure, Classes, Subclasses of Immunoglobins, Monoclonal antibodies - Production and applications

UNIT-III

Antigen Antibody interactions: Agglutination, Precipitation, Complement fixation, and Neutralization. Immunofluorescence, ELISA and RIA.

UNIT-IV

Hypersensitivity Types – I to V, Complement system – Classical and Alternative pathway. Cytokines and their functions.

UNIT-V

Transplantation Immunology: MHC, HLA- mechanism of graft acceptance and rejection, immune suppressors, auto immunity, auto immune disorders and immune deficiency disorders with special reference to AIDS.

RECOMMENDED BOOKS

- Immunology, Ivan Roitt. Brostoff and David Mole, 4th edition, 1998 Mosby Times Mirror Int Pub Ltd.
- Immunology, An introduction: Tizard K, Saunders college Publishing (1984)
- Essential Immunology. Roitt. I.M. (1988). Blackwell Scientific Publishers
- Immunology, Kuby Richard. A. Goldsby, Thomas. J. Kint, Barbara. A. Osborne, 4th Edition, 2000, W.H. Freeman and Company, New York.
- Basic and Clinical Immunology. Stites D.P. Stobo, J.D. Fundanberg. H.A and Wells. J.V. (1990) 6th edition Los Atlas Lange
- Immunology-Charles. A. Janeway. J.R. Paul Travels: Black well Scientific Publishers, 1994. (4th edition)

CORE COURSE -IX

HORMONAL BIOCHEMISTRY

UNIT-I

Introduction , classsification of hormones. Role of second messengers in hormonal action .
Hormons of the hypothalamus and pituitary- chemical nature , secretion , release and their biological functions.

UNIT-II

Hormons of the thyroid & parathyroid- chemical nature , secretion , function & dosorder of thyroid & parathyroid hormones.

UNIT-III

Pancreatic & G.I. Tract hormones – chemical nature & functions of Insulin , Glucagon . Secretion , release , chemical nature & functions of Gastrin , Enterogastin , Secretin & Cholecystokinin .

UNIT-IV

Hormones of the Adrenal gland – chemical nature & functions of Adrenal medullary & Cortex hormones .

UNIT-V

Hormones of the testes and ovaries – chemical nature & functions of Androgens , Estrogens , Progesterone .

RECOMMENDED BOOKS

- Fundamentals of Biochemistry , J.L. Jain, S. Chand publications , 2004.
- Biochemistry , Agarwal , GOBL publications , 1999.
- Textbook of Biochemistry , Edward Staunton West , Wilbert R. Todd , Howard S. Mason , John T. Van Bruggen , 4th edition , Oxford & IBH publising Co.Pvt.Ltd., 1996.
- 4. Principles of Biochemistry, David L. Nelson , Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.
- Fundamentals of Biochemistry , Donald Voet , Judith G. Voet , Charlott W. Pratt , upgrade edition John Willey & Sons. Inc,
- Biochemistry, Lubert Stryer , 4th edition, W.H. Freeman & Co, 1995.
- Concepts in Experimental Biochemistry , Brooks / Cole Publishing company , 1999.
- Mammalian Biochemistry – White Handler Smith .
- Basic & Clinical Endocrinology – Francis Sreenspan , Gordon J. Strewler Prentice – Hall International Inc. 5th ed., 1997

ELECTIVE COURSE-II**NUTRITIONAL BIOCHEMISTRY****UNIT – I**

Introduction, Energy content of food, Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action. BMR, Measurement of BMR and factors influencing BMR. The daily energy requirement , importance of energy for various activities. Calorific equivalent of major nutrients.

UNIT – II

Dietary requirements, recommended dietary allowances for infants, children and adolescent, pregnant and lactating women. Role of dietary fat, fiber, antioxidants . Proteins: Protein content of diets of people in different parts of India.

UNIT – III

Essential aminoacids, Biological value of proteins and nitrogen balance. Proteins: protein content of diets of people in different parts of India. Protein calorific malnutrition – Aetiology, management of marasmus and kwashiorkor.

UNIT – IV

Minerals - Nutritional significance of dietary macro minerals (Ca,P, Mg, S, K, Na, Cl) and trace minerals. (Iron , Iodine, Zinc and copper) Disorders related to the deficiency of minerals.

UNIT- V

Nutrition and body defenses: Effect of drugs on food and nutrients, drug - nutrient interaction nutritional therapy, food preparation and management. Role of diet and nutrition in the prevention and treatment of disease.

RECOMMENDED BOOKS

- Human nutrition and dietetics, S. Davidson and J.R. Passmore.
- Human nutrition and dietetics, IS Garraw, WPT James, 10th edition
- Food and nutrition, Narayanan.
- Modern nutrition in health and diseases, Whol and Good hart.
- Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996.

ELECTIVE COURSE III**MICROBIAL BIOCHEMISTRY****UNIT -1**

Prokaryotes and eukaryotes cell organization ,.Microscopy- Simple,Light,Dark, Phase Contrast ,Fluorescence ,SEM and TEM. Sterilization and disinfection, principles and methods.. Staining – Principles and techniques. Microbial growth factors, Bacterial Growth – Lag Phase, Exponential Phase,Linear Phase ,Continuous growth,Diauxic growth

UNIT II

Collection, handling, transport, examination of clinical specimens. Morphology, cultural , biochemical characteristics, pathogenicity, laboratory diagnosis and treatment of infections caused by Staphylococcus, Mycobacterium,Dermatophytes, Candidiasis.

UNIT III

Bacterial Membranes –Gram negative and gram positive bacteria –structure and biosynthesis of cell wall components,pencillin sensitivity, Cellular Permeability – Beta – galactoside permease, Functional relationship of galactosidase and galactoside permease ,Amino acid permeases, peptide permeases, Phosphotransferases ,Porins and Iron uptake

UNIT IV

Entner Doudoroff pathway, Energy generation aerobic ,anaerobic ,Chemolithotrophy and Phototrophy , Bacterial Photosynthesis, Pectin and Aldohexuronate pathway, Cellulose degradation, Fermentative Diversity –Clostridium and propionic acid Fermentation -Stickland reaction. Fermentation without substrate level phosphorylation.

.UNIT V

Methanogens & Methanogenesis and methylotrophs –Reaction and bioenergetics of Aerobic Methanotrophy..Syntrophy-Hydrogen consumption in Syntrophic reaction, Energetics of Syntrophic,

,Carboxydrotrophs and oxidation of Sulphur compounds-Biochemistry of sulphur oxidation

RECOMMENDED BOOKS

- Microbiology, Pelczar. Jr.M.J.Chan,McGraw- Hill Inc.NY
- Fundamental Principles of bacteriology, Salle.A.J 7th edition, 1992. Mc.Graw.
- Textbook of Microbiology, Ananthanarayanan.R. and Jayaram Panicker.C.K.OrientLongaman,1994.
- Textbook of medical parasitology, Parija.S.c, Orient Longmans,1996
- Medical Parasitology, Chatterjee, TATA McGraw Hill, 1986.
- Mehrotra RS & KR Aneja (2006),An Introduction to Mycology. Reprinted and Published by New Age International (P) Limited, Publishers, New Delhi.
- Jagdish Chander(1996) . A Text book of Medical Mycology, Interprint, NewDelhi.
- Brock Biology of Microorganisms 12th Edition-Michael T.Madigan,John M.Martinko,PaulV.Dunlap,David P.Clark
- Microbial Physiology –Albert G.Moat,John.W.Foster,Michael.P.Spector.

SKILL BASED ELECTIVE COURSE -V

BASIC BIOINFORMATICS

UNIT-I

Introduction to Bioinformatics ,History ,Current Status of Bioinformatics ,tasks of Bioinformatics ,Problems and Scope of Bioinformatics,

UNIT-II

Biological Database, properties of Biological ,Nature of biological Database- Diversity and variability,data source in life science ,Data integration , Ontology ,Bioinformatics Tools .

UNIT-III

Biological queries ,searching and Mining,Browsing ,semantics of queries , Query processing ,Biological resource ,Query planning,Query optimization, Tools for website ,Data retrieval tool.

UNIT-IV

Introduction to origin of proteomics ,Types of proteomics, Applications and future perspectives of proteomics .Introduction to Drug discovery and Drug designing .Importance parameters in drug discovery ,Areas influencing drug discovery ,Drug design Approaches .

UNIT-V

DNA and RNA structure prediction ,Limitations of prediction ,DNA and cDNA sequencing ,Genebank DNA sequencing entry,EMBL,SWISSPROT,FASTA, Sequence alignment and significance of sequence alignment

RECOMMENDED BOOKS

- Bioinformatics sequence and Genome Analysis –David .W.Mount.
- Complete practical Guide to bioinformatics for life science –Bioinformatics computing –Bryan Bergeron
- Bioinformatics –Zeonacroix
- Bioinformatics methods and applications –S.C.R astogi ,Mendiratta,P. Rastogi
- A new handbook of bioinformatics –Punith mehrotra ,Kumud serin, Swapna .K .Srivatsava

SKILL BASED ELECTIVE COURSE -VI

INDUSTRIAL BIOCHEMISTRY

UNIT-I

Introduction to fermentation technology. Isolation and screening of industrially important microbes, Inoculum preparation, strain improvement for better yield. Primary and secondary detection and assay of fermentation products. Advantages of bioprocess over chemical process.

UNIT-II

Fermentation- Submerged and solid state fermentation Fermentor design, Industrial use of microbes, Strain improvement. Inocula preparation, Down stream processing- Recovery and purification of intracellular and extra cellular products. Methods to maximize the yield.

UNIT-III

Microbial products: production of microbial enzymes-Amylase, cellulase, Pectinase and protease, Industrial production of alcohol, alcoholic beverages – Wine and Beer. Production of organic acids-Citric Acid, Acetic acid, Gluconic acid and lactic acid.

UNIT –IV

Microbes and Environment-Microbes in mineral recovery-Bioleaching and Biosorption, microbial recovery of petroleum. Microbial degradation of xenobiotics. Sewage biodegradation, Biodegradation and bioremediation, Production of Biomass, Production of Single cell protein, Mushrooms

UNIT –V

Production of bacterial and fungal polysaccharide, polyhydroxyalkanoates and microbial lipids, bioinsecticides, Industrial Production of Penicillin and streptomycin. Production of Vitamins-B12 and riboflavin.

RECOMMENDED BOOKS

- Microbiology, Pelczar. Jr. M. J. Chan, McGraw – Hill Inc. NY
- Textbook of microbiology, Ananthanarayanan. R. and Jayaram Panicker. C.K. Orient Longman, 1994
- Industrial microbiology, A.H. Patel
- Microbiology, Prescott. L.M.J.P. Harley and D.A. Klein, 2nd edition, 1993, W.C. Brown Publishing Co.
- Principles of Fermentation technology, Stanbury. P. Whalcer and S.J. Hall, 1995
- Medical microbiology, David Green Wood, Richard C.B. Slack. John Foreest Pevtherer, 14th edition, ELBS with Churchill Living Stone, 1992.
- Biotechnology – U. Sathyanarayana.

CORE PRACTICAL – III

A. Urine Analysis

1. Qualitative analysis of normal and abnormal constituents in Urine. Microscopic analysis of urine
2. Estimation of creatinine in urine
3. Estimation of urea in urine by DAM method.
4. Estimation of uric acid in urine by caraway's method.
5. Estimation of chloride in urine by Vanslke ' method
6. Analysis of urinary calculi.

B. Blood Analysis

1. Estimation of blood glucose by Asatoor and King method
2. Estimation of blood urea by DAM method
3. Estimation of creatine and creatinine in serum
4. Estimation of Total proteins in serum by biuret method
5. Estimation of bilirubin in serum (conjugated and unconjugated)
6. Estimation of cholesterol in serum by Zak's method

C. ENZYMOLOGY – Determination of the activity of SGOT and SGPT

D. HAEMATOLOGY

1. Estimation of Haemoglobin
2. Enumeration of RBC/WBC
3. Differential count
4. Determination of blood grouping
5. Bleeding time, clotting time
6. ESR, Haematocrit and PCV

CORE PRACTICAL - IV

1. Preparation of media – liquid, solid, slant
2. Culture techniques – streak plate, pour plate, spread plate.
3. Enumeration of microbes from soil, air, water.
4. Identification of microbes – biochemical tests (Imvic test)
5. Immunodiffusion – single and double diffusion
6. Immunoelectrophoresis
7. Sterilisation
8. Plant tissue culture
9. Media preparation
10. Callus induction
11. Micropropagation
12. Extraction and purification of sub – cellular organelles.
13. Restriction enzymes
14. Isolation of plasmid DNA and separation by electrophoresis
15. Isolation and separation of Genomic DNA.

NON MAJOR ELECTIVE COURSE –I

BIOCHEMISTRY IN DIAGNOSIS

UNIT-I

Approaches to clinical biochemistry: Concepts of accuracy, precision, sensitivity and reproducibility, quality control, Collection and processing of samples, anticoagulants, preservatives for blood and urine, transport of biological samples.

UNIT-II

Components of the blood (Plasma and Cellular elements) and their functions – Haemoglobin, PCV, ESR, RBC count, WBC count, Platelet count, MCH, MCV & MCHC, Absolute Eosinophil count, Differential count.

Unit III

Collection and physical examination: Collection of urine, Types of preservative, physical examination; Volume, colour, odour, appearance, specific gravity and pH. Chemical examination: Reducing sugar-Benedict test, protein: - Heat coagulation and acetic acid test, and sulfosalicylic acid test, Ketone bodies-Roth's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test, Test for mucin. Microscopic Examination

Unit IV

Stool examination: Collection of fecal specimen, preservation, physical examination; volume, colour, odour and appearance. Chemical examination; reducing sugar, occult blood test, detection of steatorrhea. Microscopic examination

Unit V

Assay of Biochemical components of Blood: Estimation of Glucose in blood, GTT, Glycosylated haemoglobin, cardiovascular disease estimation of cholesterol, Urea, Protein Uric acid and Creatinine

RECOMMENDED BOOKS

- Sabitri sanyal-(1991):Text book of pathology, first edition,
- June H.cella- (1994): manual of laboratory test, AITBS publishers.
- Kanai L.Mukherjee,Medical Laboratory Technology Vol. I.Tata McGrawHill 1996,New Delhi.
- Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I
- SabitriSanyal, Clinical pathology, B.I.Churchill Livingstone(P)Ltd, New Delhi.2000.
- Judith Ann Lewis, Illustrated guide to diagnostic tests-students version,Springhouse Corporation, Pennsylvania, 1994.
- Text book of medical Biochemistry, M.N. Chatterjee and Rane Sinde
- Text book of Biochemistry with clinical correlation, Thomas M. Devlin, 3rd edition, A. John Wiley-Liss Inc. Publication
- Practical Clinical Biochemistry, Harold Varley, 4th edition, CBS Publication and Distributors, New Delhi.
- Principles of Internal Medicine, Harrison T.R. Fauci, Braunwald, Isselbacher 14th edition, McGraw hill, New York. Volume I and II
- Tietz Fundamentals of Clinical Chemistry- (5th edition) C.A. Burtis, E.R. Ashwood (eds) Saunders WB Co.

NON MAJOR ELECTIVE COURSE –II

CLINICAL NUTRITION

UNIT I

Diet and nutrition :Assessment of nutritional status, Factors affecting digestion and absorption of food

Effects of irradiation , cooking, refining, sprouting and fermentation on nutritional quality of food Food toxins, adverse effects of alcohol, tobacco, tea.

UNIT II

Dietary requirements, recommended dietary allowances for infants, children and adolescent, pregnant and lactating women and geriatric nutrition. Role of dietary fat, fiber, antioxidants . Proteins: Protein content of diets of people in different parts of India.

UNIT III

Interrelationship between dietary lipids and cholesterol metabolism, Malnutrition and infection, Malnutrition and mental development, Nutritional basis of behavior, neutral tranquilizers

UNIT IV

Nutrition and body defenses: Effect of drugs on food and nutrients, Amino acid therapy, drug - nutrient interaction nutritional therapy, food preparation and management. Role of diet and nutrition in the prevention and treatment of disease Conditional Nutritional Disorders-Disorders of Gastrointestinal tract, Liver, Biliary tract and Pancreas and Heart, Diabetes. Food toxins and Allergy.

UNIT V

Acidic and alkaline foods, Dietary fiber- chemical composition and importance Physiological effects and metabolic adaptation during exercise, Nutritional management of inborn errors of metabolism.

RECOMMENDED BOOKS

- Human nutrition and dietetics, S. Davidson and J.R. Passmore.
- Human nutrition and dietetics, IS Garraw, WPT James, 10th edition
- Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996
- Food and nutrition, Narayanan.
- Modern nutrition in health and diseases, Whol and Good hart.

NON MAJOR ELECTIVE COURSE -III

CELL BIOCHEMISTRY AND HUMAN PHYSIOLOGY

UNIT I

Cell classification, cell variability, size, shape and complexity, function, Prokaryotes, cell - structure and components Eukaryotic cell : Structure, sub cellular components: nucleus, chromosomes, plasma membrane, cell wall, endoplasmic reticulum, lysosomes, peroxisomes, golgi apparatus, mitochondria, chloroplast, cytoskeleton, pili, flagellum.

UNIT II

Cell division, mitosis and meiosis, cell cycle, Plant cells: Cell wall and its function, xylem, phloem and epidermal cells. The interaction and communication between the cells, cell-cell reorganization in plants, role of golgi vesicles in plasma membrane, cell growth and division.

UNIT – III

Digestive System: Secretions of digestive tract, digestion, absorption, assimilation of carbohydrates, proteins, fats, nucleic acids, vitamins and minerals.

UNIT – IV

Respiratory System: Transport and exchange of gases between lungs and tissues, Blood composition, function and mechanism of blood coagulation.

UNIT – V

Excretory and Circulatory system: Structure and function of Kidneys . Structure and function of heart and lymphatic system.

RECOMMENDED BOOKS

- Text-book of Biochemistry with clinical correlations by Thomas M. Devlin, 2nd Edition, Wiley and Sons (1986). Physiological chemistry by Harper.
- Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.
- Physiological basis of Medical practice, West J.B., Best and Taylor.
- Introduction to Physiology by Davidson H and Segal M.B. Academic Press.
- Microbiology, M.S. Pelczar, R.D. Reid, E.C.S. Chan, Mc Graw Hill, New York (1986).
- General Microbiology (Vth Edition), R.Y. Stanier, Prentice Hall (1986) Biochemical Engineering, S Aiba, A.E. Humphrey, Nancy F. Mills, University of Tokyo Press. (1978).
- Introductory Microbiology, F.C. Ross, Charles Merrill Publication (1983).

NON MAJOR ELECTIVE COURSE -IV**BIOCHEMISTRY AND HEALTH****UNIT – I**

Carbohydrate – Source of carbohydrates, Importance of carbohydrates in living organisms, Normal level of sugar in humans, Diabetes mellitus and its complications in human .Control and prevention of diabetes mellitus.

UNIT – II

Proteins –Sources of proteins and amino acids. Importance of proteins in living organisms. Normal level of proteins in human. Protein deficiency disease-Kwashiorkor and Marasmus, Protein quality .

UNIT – III

Fatty acids - Source of fats and importance of fats and lipids in living organism and. Role of LDL, VLDL, HDL and chylomicrons in human body. Normal levels of cholesterol hypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and Heart attack. Prevention and control of heart related diseases

UNIT – IV

Vitamins –Source of water soluble and fat soluble vitamins. Deficiency disorders of Vitamins and importance of vitamins in humans.

UNIT – V

Minerals – Source and deficiency disorders of calcium, magnesium, sodium, potassium, phosphorus, Iron, Iodine in humans.

REFERENCE BOOKS

- Text book of Medical Physiology –Guyton.A.C
- Human Physiology by Chatterjee
- Food facts and principles,Shakuntala Manay
- Deb .A.C., Fundamentals of Biochemistry, Books and allied (p) Ltd,2002.
- Essentials of Biochemistry Sathyanarayanan.U. Books and allied (p) Ltd,2002
- Biochemistry Ambika shanmugam

SEMESTER I**ALLIED BIOCHEMISTRY COURSE -I****UNIT-I**

Carbohydrates: Introduction, classification, monosaccharide-structure, stereoisomers and structural isomers, mutarotation, and chemical reactions. Oligosaccharides-Dissaccharides-structure and importance of sucrose, Lactose, maltose, .Polysaccharides-structure and importance of homopolysaccharides and heteropolysaccharides.

UNIT-II

Amino acids : Classification, Essential & Non essential amino acids, structure and properties. **Protein:** Definition, classification and functions – structural levels of organization

UNIT-III

Enzymes – Definition, classification with example, active site, lock & key model, induced fit hypothesis. Enzyme units – kinetics- factors affecting enzyme activity,

UNIT -IV

Lipids: Classification, physical & Chemical properties, saturated and unsaturated fatty acids , Structure of cell membrane & transport.

UNIT-V

Vitamins: Classification, occurrence, deficiency symptoms, biochemical functions of fat soluble and water soluble Vitamins.

RECOMMENDED BOOKS

- Lehninger's Principles of Biochemistry (2000) by Nelson, David I. and Cox, M.M. Macmillan/ worth, NY
- Fundamentals Of Biochemistry (1999) by Donald Voet, Judith G. Voet and Charlotte W Pratt, John Wiley & Sons, NY
- Biochemistry 3rd (1994) by Lubert Stryer, W H Freeman and co, San Francisco.
- Biochemistry 4th edition (1988) by Zubay G L , W M C Brown Publishers.
- Principles of Biochemistry (1994) Garrette & Grisham, Saunders college publishing
- Outlines of Biochemistry (1987) by Eric E. Conn, P.K. Stumpf, G. Brueins and Ray H. Doi, John Wiley & Sons, NY
- Text book of biochemistry (1997) 4th edition Thomas M devlin, A John Wiley, Inc publication, New York.

ALLIED PRACTICAL –I –BIOCHEMISTRY

1. Qualitative Analysis

- i. Analysis of carbohydrates– Glucose, Fructose, Ribose, Sucrose, Lactose and Starch.
- ii) Analysis of Amino acids - Tyrosine, Tryptophan, Arginine, Methionine, Cystine & Phenylalanine.

2. Preparation

- i. Starch from potato
- ii. Casein from milk
- iii. Phospholipids from Egg yolk.

3. Quantitative Analysis

- i. Estimation of Glycine by formal titration method.
- ii. Estimation of Ascorbic acid by 2,6 dichlorophenol indophenol dye
- iii. Determination of Acid number
- iv. Determination of Saponification value
- v. Estimation of Urea by DAM colorimetric method
- vi. Estimation of Glucose by Ortho- Toluidine Method

4. Techniques

- i. Separation of Amino acid & Sugars by Ascending paper chromatography
- ii. Separation of Lipid by TLC

SEMESTER II**ALLIED BIOCHEMISTRY COURSE –I****UNIT I**

Buffers – Definition and determination of pH , Henderson Hasselbalch Equation. Dialysis, Surface tension and Viscosity.

Principle and Applications of Colorimetry and Chromatography

UNIT II

Carbohydrate metabolism -Glycolysis , Glucogenesis , Glycogenolysis ,Citric acid cycle & HMP shunt.

Lipid metabolism- Beta & omega oxidation, Biosynthesis of Saturated &Unsaturated fattyacids.

UNIT III

Protein metabolism -Transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle.

Interrelationship of carbohydrates, proteins and fat metabolism

UNIT IV

Bioenergetics –Law of thermodynamics, Redox potential, Respiratory chain ,Oxidative phosphorylation (Theories and Mechanism),High energy compounds .

UNIT V

Hormones – Definition, Classification of Hormones, Secondary messengers (Cyclic AMP, IP3 and DAG)Biological function and disorders of Pancreatic Hormones (Insulin), Thyroid hormone (thyroxin)

RECOMMENDED BOOKS

- Principles and techniques of practical Biochemistry, Keith Wilson and John Walker,1995.Cambridge University Press.
- Biophysical chemistry Principles and Techniques- Avinash Upadhyaye and Nirmalendhe Nath , Himalaya Publishers.
- A Biologist Guide to Principles and Techniques of Biochemistry , Keith Wilson and Kenneth Goulding, Edward Arnold publishers.
- Principles of Biochemistry ,Emil I.Smith
- Endocrinology – Williams
- Fundamentals Of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY
- Outlines of Biochemistry (1987) by Eric E.Conn, P.K. Stumpf, G.Brueins and Ray H.Do, John Wiley & Sons, NY
- Biochemistry 3rd (1994) by lubert stryer, W H freeman and co, Sanfrancisco.
- Text book of biochemistry (1997) 4th edition Thomas M devlin, A John Wiley, In
- Principles of Biochemistry (1994) Garrette & Grisham, Saunders college
- Essentials of Biochemistry Sathyanarayanan.U. Books and allied (p) Ltd,2002 Publishing

RECOMMENDED BOOKS FOR B.Sc BIOCHEMISTRY PRACTICALS

- Practical Clinical Biochemistry, Volume I and II – Harold Varley, et al., CBS Publishers , Fifth Edition, 1980.
- Biochemical Methods. Sadasivam .S and Manickam, A. II Edition. New Age International Private Ltd. Publishers.
- Laboratory techniques in Biochemistry and Molecular Biology , Work and Work.
- A Biologist's Guide to principles and Techniques of Practical Biochemistry, K.Wilson and K.H.Goulding, ELBS Edition,1986.
- Modern Experimental Biochemistry Boyer, R, III Edition , Benjamin Cummings Publishers.
- A Text Book of Practical Biochemistry, by David Plummer.
- Enzyme Structure and Mechanism, Aln Fersht (1997).
- Introductory Practical Biochemistry –S.K.Sawhney,Randhir Singh
- Practical Immunology 4th ed by Frank C.Hay Olywn
- Practical Manual of Biochemistry – S.P Singh
- Laboratory Mannual in Biochemistry by S.Jayaraman
- Laboratory Manual in Biochemistry – T.N .Pattabiraman
- Handbook of Emergency Lab Test –L.I.G.Worthley
- Practical Immunology –Frank L.Hay ,Olwyn.M.R.Westwood