BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.

B.Sc. Biochemistry – Course Structure under CBCS

(For the candidates admitted from the academic year 2010-2011 onwards)

Semester	Part	Course	Title	Instru Hours/ Week	Credit	Exam Hours	Marks		Total
							Int.	Extn.	
I	I	Language Course – I (LC) – Tamil/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course – I (CC)	Biomolecules	5	5	3	25	75	100
		Core Course – II (CC)	Practical I	6	4	3	40	60	100
		First Allied Course –I (AC)	Chemistry – I Theory	5	4	3	25	75	100
		First Allied Course – II (AC)	Chemistry – II - practical	2	-	***	-	-	-
				30	19				500
II	I	Language Course – I (LC) Tamil/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course – II (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Biochemical techniques	6	5	3	25	75	100
		First Allied Course – II (AC)	Chemistry – II - Practical	3	2	3	40	60	100
		First Allied Course – III (AC)	Chemistry III	5	4	3	25	75	100
	IV	Environmental Studies		2	2	3	25	75	100
		Value Education		2	2	3	25	75	100
				30	21				700
III	I	Language Course – I (LC) Tamil/Other Languages ** #		6	3	3	25	75	100
	I I	English Language Course - III (ELC)		6	3	3	25	75	100
	III	Core Course – IV (CC)	Human Physiology	6	5	3	25	75	100
		Second Allied Course – I AC	Theory	**6**	4	3	25	75	100
		Second Allied Course – II AC	Practical	**3**	-	***	-	-	-
		Non Major Elective- I for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Health and diseases	**3**	2	3	25	75	100
				30	17				500
IV	I	Language Course –I (LC) Tamil/Other Languages ** #		6	3	3	25	75	100

	II	English Language Course – IV (ELC)		6	3	3	25	75	100
	III	Core Course – V (CC)	Enzymes	4	4	3	25	75	100
		Core Course – VI (CC)	Practical II	4	3	3	40	60	100
		Second Allied Course-II (AC)	Practical	2	2	3	40	60	100
		Second Allied Course-III (AC)	Theory	4	4	3	25	75	100
	IV	Skill based elective-I		2	**4**	3	25	75	100
		Non Major Elective II - for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Food and Nutrition	2	2	3	25	75	100
				30	25				800
V	III	Core Course – VII (CC)	Bio energetic and metabolism	5	5	3	25	75	100
		Core Course – VIII (CC)	Molecular biology	5	5	3	25	75	100
		Core Course – IX (CC)	Microbiology	4	4	3	25	75	100
		Core Course – X (CC)	Practical-III	7	5	3	40	60	100
		Major Elective Course – I	Pharmaceuticals Biochemistry	5	5	3	25	75	100
	IV	Skill based Elective –II		2	**4**	3	25	75	100
		Skill based Elective – III		2	**4**	3	25	75	100
				30	**32**				700
VI	III	Core Course – XI (CC)	Basic Biotechnology	**6**	5	3	25	75	100
		Core Course – XII (CC)	Clinical Biochemistry	**6**	5	3	25	75	100
		Core Course -XIII (CC)	Practical - IV	6	5	3	40	60	100
		Major Elective Course II	Endocrinology	**6**	5	3	25	75	100
		Major Elective Course III	Immunology	**5**	4	3	25	75	100
		Extension Activities		-	1	-	-	-	-
		பாலின சமத்துவம்		1	1	3	25	`75	100
				30	26				600
			Total	180	140				3800

Note:

	Internal Marks	**External Marks**
1. Theory	25	75
2. Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

   The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

   The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

* for those who studied Tamil upto +2 (Regular Stream)

** Syllabus for other Languages should be on par with Tamil at Degree level

those who studied Tamil upto 10th or +2, but opt for other languages in degree level under Part I should study special Tamil in Part IV

*** Examination at the end of the next semester.

Extension activities shall be out side the instruction hours.

List of Allied Courses :

Group – I	**Group – II (Any one)**
Chemistry (compulsory)	1. Botany 2. Zoology 3. Computer Science 4. Applied Statistics

செய்முறை பாடங்கள் உள்ள இயைபுப் பாடங்களுக்கு (4+2+4) தரபுள்ளிகள்

செய்முறை பாடங்கள் இல்லாத இயைபுப் பாடங்களுக்கு(3+3+4) தரபுள்ளிகள

CORE COURSE I – BIOMOLECULES

Unit 1

Carbohydrates: Classification and structural elucidation of glucose and fructose. Interconversion of sugars. Properties, structure and biological functions of mono, di, oligo and polysaccharides. Homoglycans and Heteroglycans. Blood group polysaccharides.

Unit 2

Amino acids: Structure, classification, physical and chemical properties. Titration curves of aminoacids. Colour reactions of Amino acids. Peptides: Amides and peptides, peptide bond, peptide synthesis, biologically important peptides.

Proteins: classification and Biological importance. Primary structure, Secondary, tertiary and quaternary structure- forces stabilizing the structure of proteins. Denaturation, isolation and characterization. Precipitation by salts, separation by solubility differences- isoelectric pH, salting out. Purification of proteins.

Unit 3

Nucleic acids: Components of mono nucleotides, pyrimidines and purines. Nucleotides, nucleosides, nucleoside 5' diphosphates and 5' triphophates. Polynucleotides: DNA and RNA. Composition and structure- their biological importance hydrolysis of nucleic acids by acids, bases and enzymes. Denaturation and renaturation. Isolation, separation and purification of DNA and RNA.

Unit 4

Lipids: nomenclature, classification and Biological significance. Simple lipids: types of fatty acids, triglycerides, waxes, steroids, prostaglandins and their properties. Compound lipids: Phospholipids, sphingolipids and glycolipids. Lipoproteins.

Analysis of oils: Reichert-Meisel value, Iodine number, saponification value, acid number and acetyl value.

Unit 5

Vitamins. Source, structure, biological role, daily requirement and deficiency manifestation of the fat soluble vitamins A,D,E & K. Water soluble vitamins- Ascorbic acid, thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B_{12}.

References

1. Principles of Biochemistry – Lehninger
2. Textbook of Biochemistry-West & Todd.
3. Harper's Biochemistry 25th edn, Mc Graw Hill.
4. Fundamentals of Biochemistry – O.P. Agarwal.
5. Essentials of Biochemistry – M.C. Pant.
6. Essentials of Biochemistry – A.I. Jain.

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CORE COURSE – II: PRACTICAL – I

Quantitative Analysis

1. Qualitative analysis of carbohydrates (glucose, fructose, maltose, galactose, sucrose, lactose), Identification of both monosaccharides and disaccharides in mixtures.

2. Color reactions of amino acids like tryptophan, tyrosine, arginine, proline and histidine.

3. Reactions of lipids: Solubility, acrolien test for unsaturation, Libermann-Burchard test for cholesterol.
4. Acid number, iodine number and saponification number of lipids.
5. Estimation of reducing sugar by Benedict's quantitative method.
6. Estimation of amino acids by formal titration.
7. Estimation of ascorbic acid by titrimetric method using 2,6-dichlorophenol indophenol.
8. Estimation of sodium and potassium by flame photometry.
9. Determination of saponification number

References

1. Manuals in Biochemistry – Dr. J. Jayaraman.
2. Practical Biochemistry – Varley.
3. Practical Biochemistry – Plummer.
4. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh.

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CORE COURSE – III: BIOCHEMICAL TECHNIQUES

Unit 1

Laws of thermodynamics- First, second, third and zero law. Law of mass action. Oxidation reduction reactions. Potentiometric titration of oxidation- reduction reactions. Principle and applications of oxygen electrode Electrochemical techniques- Measurement of pH, Standard hydrogen electrode-, Henderson- Hessel balch equation. Types of buffer, role of Buffers in biological system.

Colloids- types and membrane phenomena - Electrical charge of colloidal particles. Surface tension, adsorption, viscosity and osmotic pressure. Donnan membrane equilibrium. Determination of molecular weight by osmotic pressure and viscosity.

Unit 2

Chromatography: adsorption, partition chromatography- Principle, methods and applications of paper chromatography, Thin layer chromatography, column chromatography, Gas-liquid chromatography, and Ion exchange chromatography. High performance liquid chromatography, molecular sieve chromatography and affinity chromatography.

Unit 3

Electrophoresis: Principle, instrumentation and applications of paper electrophoresis, Agarose gel electrophoresis, PAGE, cellulose acetate electrophoresis, Immunoelectrophoresis, Isoelectricfocussing and molecular weight determination. Principle and applications of sourthen and western blotting.

Principles of centrifugation. Low speed and high speed centrifugation. Preparative, Analytical ultra centrifuge- Instrumentation and applications. Basic principle and technique of subcellular fractionation by differential centrifugation.

Unit 4

Spectroscopy: Colorimetry, Beer-Lambert's law, measurement of extinction, calibration curve. Spectrophotometer, absorption spectra, components of instrument principle and applications of spectrofluorimetry and MALDI-TOF. Principle, instrumentation and applications of flame photometer, atomic absorption, NMR, ESR and mass spectroscopy.

Unit 5

Radioisotopes: Radioactive decay, units of radioactivity. Measurement of radioactivity- Geiger muller counter. Scintillation counter, and Autoradiography. Applications of radioisotopes in Biology. Manometry: The Warberg constant volume- Gilson differential respirometer- Uses of Warberg and Gilson manometry.

References

1. Principles and techniques of practical Biochemistry – Wilson and Walker.
2. Biophysical chemistry – principles and techniques – Upadhyay, Upadhyay and Nath.
3. Practical Biochemistry – Williams and Wilson.
4. Laboratory manual in Biochemistry – J. Jayaraman.

CORE COURSE – IV: HUMAN PHYSIOLOGY

Unit 1

Digestive system: Anatomy of the digestive system, Salivary, Gastric and Biliary Secretions- composition and functions. Intestinal hormones, movements in Gastro intestinal tract, Secretion, digestion and absorption in the small intestine. Absorption in the large intestine; Digestion and absorption of carbohydrates, lipids and proteins.

Unit 2

Body fluids: Extracellular fluid-plasma, interstitial fluid and transcellular fluid. Intracellular fluid: Lymph & Blood-composition, functions, osmolarity of the body fluids, ionic composition, electrolytes, body buffers. Blood cells, haemoglobin, haemopoiesis, blood coagulation and blood groups.

Unit 3

Circulation: Structure of Heart and blood vessels, cardiac cycles, cardiac factors controlling blood pressure, electrocardiogram. Functions of heart. Respiration: Anatomy, and physiology of respiration, pulmonary surfactant, exchange of gases between lung and blood and between blood and tissues. Role of lung in acid-base balance.

Unit 4

Excretory system: Structure and functions of kidney. Urine- composition and formation. Renal regulation of acid-base balance. Muscle: Kinds of muscle, structure. Mechanism and theories of muscle contraction.

Unit 5

Central nervous system- General organisation. Functional units. Resting and action potential- conduction of nerve impulse. Synaptic transmission. Brain- chemical composition, metabolism, metabolic adaptation, neurotransmitters and cAMP. Biochemical aspects of learning and memory. Enkephalins and endorphins.

References

1. Human Physiology: Vol I & II C.C. Chatterjee.
2. Functions of the Human body – Guyton A.C.
3. The living body-Best C.H, Taylor N.B.
4. Human Physiology-Systemic & applied-Sahalya.
5. Human Nutrition and Dietetics – Swaminathan, Bangalore printing and Pulv. Co. Ltd.
6. Review of Medical Physiology – Ganong, Appleton and Lange.

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NON MAJOR ELECTIVE I- HEALTH AND DISEASES

Unit I

Introduction to Health and Diseases : Electrolytes anda cid-base balance – Regulation of electrolyte content of body fluids and mainteneance of pH, reabsorption of electrolytes. Respiratory & renal mechanism, Acidosis & alkalosis. A brief review of units and abbrevations used in expressing concentrations and standard solutions. Specimen collection and procesing (blood, urine and feaces). Anti-coagulant and préservatives for blood and urine.

Unit II

Disorders of Carbohydrate Metabolism : Diabetes melitus, glucose and galactose tolerance tests, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, glycogen storage diseases, pentosuria, galactosemia. Blood glucose homeostasis – role of tissues and hormones.

Unit III

Disorders of Lipids and Proteins : Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemia, Gauchers disease, Tay-Sachs and Niemann-Pick disease, ketone bodies, Abetalipoproteinema. Abnormalities in Nitrogen Metabolism-Uremia, hyperuricemia, porphyria and factors affecting nitrogen balance.

Unit IV

Disorders of liver and kidney : Jaundice, fatty liver, normal and abnormal functions of liver and kidney, Liver function test, Renal function test. Diagnostic Enzymes – Enzymes in health and diseases. Biochemical diagnosis of diseases by enzyme assays SGOT, SGPT, CPK, Cholinesterase, LDH

Unit V

Inborn Errors of Metabolism : Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyban syndrome, sickle cell anemia, Histidinemia

Books Recommended

1. Text Book of clinical Biochemistry – Cart A. Burdis and Edward R. Ashwood
2. Text Book of Medical Biochemistry – M.N. Chatterjee and Rane shinde
3. Clinical Biochemistry – Hoffmann
4. Biochemistry with clinical correlation – Devlin
5. Practical Clinical Biochemistry – Harold Varley

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CORE COURSE – V: ENZYMES

Unit 1

Enzymes- Definition, nomenclature and classification of enzymes, properties.Structure and functions of coenzymes. Metallo enzymes and metal enzymes. Units of enzyme activity, turn over number. Non protein enzymes- ribozymes and abzymes.

Unit 2

Isolation and purification of enzymes: Methods of purification. Separation procedures based on molecular size, solubility difference and electric charge and selection adsorption. Criteria of purity of enzymes.

Unit 3

Enzyme kinetics: Factors influencing enzyme activity, Derivation of Michalis- Menton equation, Lineweaver-Burk plot, activators, Inhibitors kinetics - Types of inhibition- Competitive, noncompetitive, uncompetitive, feed back inhibition and allosteric inhibition.

Unit 4

Mechanism of enzyme action- active site, Lock and Key model, induced fit hypothesis. Mechanism of enzyme catalysis, enzyme-substrate complex formation, mechanism of bisubstrate reactions. Allosteric enzymes.

Unit 5

Multienzyme complex- pyruvate dehydrogenase, Isoenzymes of lactate dehydrogenase. Immobilized enzymes- principles and applications: Enzymes as a marker in clinical diagnosis. Industrial applications of enzymes.

References

1. Diagnostic Enzymology – Hawcroft, John Wiley.
2. The nature of enzymology – Foster.
3. Fundamentals of enzymes – Price.
4. Enzymes-Dixon & Webb.
5. Biochemistry – Stryer.
6. Understanding enzymes – T. Palmer, Prentice Hall.

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CORE COURSE – VI: PRACTICAL – II

1. Preparation of buffers and measurement of pH.
2. Titrable acidity of amino acids.
3. Paper chromatography of sugars and amino acids.
4. Thin layer chromatography of amino acids and lipids.
5. Separation of plant pigments by column chromatography.
6. Paper electrophoresis.
7. Donnon membrane equilibrium.
8. Preparation of cell free homogenate, isolation of mitochondria and nuclei from rat liver and chloroplast from leaves.
9. Simple demonstration by manometry.
10. Isolation of DNA and RNA: Estimation of RNA by orcinol method and DNA by diphenyl amine method.

References:

1. Manuals in Biochemistry – Dr. J. Jayaraman.
2. Practical Biochemistry - Varley
3. Practical Biochemistry – Plummer.
4. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh.

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NON MAJOR ELECTIVE II - FOOD AND NUTRITION

Unit 1

Sources, food composition, properties and storage of common foods. Functions of food in relation to health- classification of foods based on nutrients. Food preservation- reasons for preserving foods, methods of preservation – an understanding of the principles involved, food additive in processed food and their effects. Food groups to provide nutritive requirement for normal health- body building foods, energy foods and protective foods.

Unit 2

Basics for computing nutrient requirements: latest concepts in dietary recommendations, RDA – ICMR and WHO: their uses and limitations. Definition of unit of energy – cal, RQ, SDA and NPU. Energy metabolism: Basal and resting metabolism – influencing factors, Methods to determine energy requirements and expenditure. The sources and functions of essential nutrients – proteins (high biological and low biological value), carbohydrates and fats. Sources and functions of dietary fibre, Pro and Prebiotics.

Unit 3

Micro and macro mineral nutrients: Distribution sources, metabolic functions and deficiency manifestations – Calcium, Phosphorus, Sodium, Potassium, Iron, Copper, Selenium and Zinc.

Fat and water soluble vitamins – Occurrence, properties and function – Hyber and Hypovitaminosis. Role of Vitamin as Antioxidant.

Unit 4

Nutrition through life cycle. Special needs of Infants, children, adolescents, pregnant and lactating women, convalescents and old persons

Unit 5

Principles of diet therapy. Diet during stressed conditions- laborers. Patients- therapeutic diets for anemia, malnutrition, obesity, diabetes mellitus and allergy.

References

1. Food Chemistry – L.G. Meyer.
2. Food Science – Polter.
3. Fundamentals of food chemistry – W. Heimann.
4. Introducing food chemistry – Garrad.
5. Essentials of food and nutrition – Vol I & II, Swaminathan M.
6. Human nutrition & Dietics – Passemore R and others.

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CORE COURSE – VII: BIOENERGETICS AND METABOLISM

Unit 1

Bioenergetics: Free energy and entropy changes in biological system, coupling of endergonic and exergonic processes. High energy phosphates and their role in redox reaction. Biological oxidation.Enzymes involved in oxidation and reduction- oxidases, dehydrogenases, hydroperoxidase and oxygenases. Cytochrome P-450 monooxygenases system.

Unit 2

Mechanism of oxidative phosphorylation. Chemiosmotic theory, respiratory chain complexes ,oxidative phosphorylation, uncouplers, inhibitors, ionophores. Mitochondrial transport systems. Malate and glycerophosphate shuttles. Membrane bound enzymes in energy production.

Unit 3

Carbohydrate metabolism: Glycolysis and its energetic. gluconeogenesis, oxidation of pyruvate to acetyl CoA, TCA cycle and its regulation , energetics of anaplerotic reactions; Hexose monophosphate pathway, glycogens and glycogenolysis, glucuronic acid cycle; glyoxalate cycle; metabolism of galactose and fructose.

Unit 4

Lipid metabolism: Biosynthesis of fatty acids- biosynthesis and catabolism of triglycerides, phospholipids and glycolipids. Oxidation of fatty acids α, β and γ oxidation; Cholesterol-synthesis, transport degradation and excretion. Ketogenesis; plasma lipoproteins-metabolism.

Unit 5

Protein, nucleic acid and porphyrins metabolism: Deamination, decarboxylation, transamination of amino acids, glycogenic and ketogenic amino acids, urea cycle, biosynthesis and catabolism of amino acids, metabolism of purine and pyrimidine nucleotides. Biosynthesis and degradation of porphyrins, Heme, Bile pigments formation.

References

1. Principles of Biochemisry – Lehninger.
2. Harper's review of Biochemistry-David W. Martin.
3. Biochemistry – Stryer.
4. Biochemistry – Voet & Voet.
5. General Biochemistry – Weil (Wiley Eastern, India).
6. Biochemistry – Mathews.

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CORE COURSE – VIII: MOLECULAR BIOLOGY

Unit 1

Identification of DNA as genetic material- Aveng, Merlead, Maccarty experiment – Griffth experiment. Genomic organization - Histone and Non histone protein coding and Non coding DNA - DNA replication semiconservative mode of replication. Enzyme machinery for DNA replication- topoisomerases, polymerases, ligase- supercoiling of DNA. DNA damage and repair photo reactivation excision and post replication- repair.

Unit 2

Transcription. RNA polymerase, strages of transcription, inhibitors of RNA synthesis, reverse transcription. Post transcriptional modification of t RNA, r RNA and m RNA.

Unit 3

Genetic code: Major features of genetic code and Wobble hypothesis. Gene- Cistron, recon, muton, one gene one enzyme hypothesis.

Translation- structure of prokaryotic and eukaryotic ribosomes. Mechanism of translation- amino acid activation, initiation, elongation and termination. Inhibitors of protein synthesis. Post translation modification of protein

Unit 4

Gene expression- prokaryotic transcriptional regulation. Enzyme induction and repression. The operon hypothesis. Lac, trp operons.

Unit 5

Genetic engineering: Vehicles for cloning- plasmids, phages and cosmids. Restriction endonucleases and their applications. Splicing of DNA molecules- cohesive end, poly dA-dT tailing and blunt end ligation methods. Outlines of gene cloning: plasmids, cosmids as vectors. Restriction endonucleases and ligases- selection of clones. Applications of genetic engineering in medicine

References:

1. Molecular Cell Biology – Lodish.
2. Principles of Biochemistry – Lehninger.
3. Molecular Biology – Freifelder.
4. Molecular Biology of the Cell – Bruce Albert.
5. Molecular Biology of the Gene – Watson.
6. Biochemistry. Davidson and Sittmann, NMS 4th edn. Lippincott Williams and Wikins, 1999.

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CORE COURSE– IX: MICROBIOLOGY

Unit 1

Bacteriae. Eubacteria, cyanobacteria, Archaebacteria, Bergey's classification scheme for bacteria. Staining of bacteria. Size and shape of bacterial cells. Modes of reproduction, enumeration, bacterial growth curve, synchronous growth, physical and chemical methods of controlling bacterial growth.Cultivation of bacteria. Nutritional requirements. Types of media. Factors affecting growth. Choice of media and conditions of incubation. Isolation and maintenance of pure cultures.

Unit 2

Fungi, Algae and viruses. Fungi- classification, cultivation and morphology of yeasts and molds. Control of fungal growth. Algae- occurrence, characteristics, classification and biological, importance. Viruses of bacteria, bacteriophages, general characteristics.

Unit 3

Food Microbiology- Food spoilage, food preservation, fermented foods. Infected foods and human illness- botulism, Clostridium welchi poisoning, Staphylococus poisoning, Salmonella- infection. Dairy microbiology- contamination of milk by bacteria. Bacterial count. Reactions occuring in milk. Pasteurization and sterilization, fermented milk products, cheese.

Unit 4

Medical Microbiology. Infection- sources and transmission of infection. Types of infection and factors influencing infection. Harmful microbes- endo and exotoxins. Antimicrobial agents. Sterilization and disinfection.

Unit 5

Microscopical examination of microorganism-Bright field, Dark field principle and applications of fluorescent and phase contrast, scanning electron microscope and transmission microscopy

References

1. Microbiology M.J. Pelezar, Jr. Et al. Mc Graw Hill.
2. Microbiology – Essential and applications Mc Kane and Kendel Mc Graw Hill.
3. Text book of Microbiology. Ananthanarayanan and Paniker Orient Long.
4. Review of Medical Microbiology, Jawetz et al. Large Medical.
5. Encyclopedia Microbiology – Lederberg, Academic Press.
6. Text Book of Microbiology - Jayaraman panikar,

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CORE COURSE – X : PRACTICAL – III

Food and Enzyme Analysis

1. Moisture content of food materials.
2. Ash content of food materials.
3. Estimation of carbohydrate by Anthrone method.
4. Estimation of fat content in food materials (Wheat, rice, flour, gram flour).
5. Estimation of nitrogen, iron, phosphorus, calcium.
6. Determination of specific activity, m (Saturation method), pH and temperature of alkaline phosphatase and amylase.

References

1. Manuals in Biochemistry – Dr. J. Jayaraman.
2. Practical Biochemistry – Plummer.
3. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh.
4. Text book of Clinical Chemistry – Tietz.

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CORE COURSE – XI : BASIC BIOTECHNOLOGY

Unit 1 Fermentation Biotechnology

Basic principles of microbial growth. The bio reactor– types and operation. Fermentation culture medium. Downstream processing.

Unit 2 Food and enzyme technology

Biotechnology in food industry– food fermentation, fermented foods and milk products. Immobilised cells methods of immobilisation, properties and applications. Production of industrial enzyme- Amylase.

Unit 3 Energy and Environmental Biotechnology

Biological fuel generation– Ethanol and methane from biomass. Waste water and sewage treatment. Bioremediation– oil spill clean up. Microbial mining.

Unit 4 Recombinant DNA technology

Gene organisation and flow of genetic information (elementary details only). Basic principles of cloning: restriction endonucleases, cloning vectors, introduction into host by electroporation and microinjection, selection and screening of recombinants.

Unit 5 Plant and Animal Biotechnology

Applications of rDNA technology in agriculture and animal husbandry: development of transgenic plants and animals– basic principles and applications. The human genome project (elementary details only).

References

1. Biotechnology J.E. Smith Cambridge Univ. Press, 1996.
2. An introduction to genetic engineering – D.S.T. Nicholl, 2nd edn. 2002, Cambridge Univ. Press.
3. An Engineering introduction to Biotechnology Fitch J.P. Prentice Hall, New Delhi 2004.
4. Elements of Biotechnology P.K. Gupta, Rastogi. Pub. 1998.
5. A text book on biotechnology. H.D. Kumar 2nd Ed. East West Press 1998.

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CORE COURSE – XII : CLINICAL BIOCHEMISTRY

Unit 1

Gastric function tests- hyper, hypo and achlorhydria. Liver function tests. Jaundice hemolytic, hepatic and obstructive jaundice. Renal function tests. Biochemical findings in nephritis and nephrotic syndrome. Normal and abnormal constituents of urine.

Unit 2

Disorders of carbohydrate metabolism: Sugar level in normal blood- maintenance of blood sugar concentration- endocrine influence on carbohydrate metabolism, hypoglycemia, hyperglycemia, glycosuria, renal threshold value, diabetes mellitusclassification, complications; Glucose tolerance test (GTT), diabetic coma, diabetic ketoacidosis, glycogen storage diseases, fructosuria, galactosemia and hypoglycemic agents.

Unit 3

Disorders of lipid metabolism. Plasma lipoproteins- lipoproteinemias, lipid metabolism in liver and adipose tissue. Fatty liver. Hypo and hypercholesterolemia. Atherosclerosis.

Unit 4

Disorders of amino acid metabolism. Plasma proteins in health and disease. Disorders of purine, pyrimidine and porphyrin metabolism. Hyperuricemia and gout. Lesch- Nyhan syndrome. Orotic aciduria, porphyrias.

Unit 5

Disorders of endocrine system. Disorders of thyroid, pituitary, adrenal medulla, and sex hormones. Disturbances in blood clotting mechanisms- hemophilia and anemia. Complications of Acquired immune deficiency syndrome (AIDS)

References

1. Applied Biochemistry of clinical disorders – Allan G. Gornall.
2. A clinical companion to Biochemical Studies – Victor Schwarz.
3. Biochemistry for Medical Students – Ambika Shanmugam.
4. Practical Clinical Biochemistry – Harold Varley.
5. Clinical Biochemistry in diagnosis and treatment. Mayne ELBS.

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CORE COURSE – XIII: PRACTICAL – IV

Clinical Biochemistry

1. Qualitative tests of urine. Abnormal constituents- sugar, protein (albumin), ketone bodies, bile pigments and bile salts.

2. Quantitative estimations in Blood
    a. Glucose
    b. Cholesterol
    c. Calcium
    d. Urea
    e. Iron
3. Quantitative estimation in urine.
    a. Sugar
    b. Urea
    c. Creatinine
    d. Creatine
4. ESR, PCV, TC/DC count, haemoglobin content and blood grouping.

***References*:**

1. Manuals in Biochemistry – Dr. J. Jayaraman.
2. Practical Biochemistry - Varley
3. Practical Biochemistry – Plummer.
4. Practical clinical Biochemistry – Harold Varley.
5. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh.
6. Text book of Clinical Chemistry – Tietz.

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Major Based Elective – I : PHARMACEUTICAL BIOCHEMISTRY

Unit 1

Classification of drugs based on sources: mode of administration, site of action, absorption of drugs, Drugs distribution and elimination, Role of kidney in elimination.

Unit 2

Drug metabolism: Chemical pathways of drug metabolism. Phase I and Phase II reactions, role of cytochrome P450, non-microsomal reactions of drug metabolism, drug metabolising enzymes.

Unit 3

Chemotherapy: Biochemical mode of action of antibiotics- penicillin and chloramphenicol. Action of alkaloids, antiviral and antimalarial substances. Biochemical mechanism of drug resistance.

Unit 4

Adverse responses and side effects of drugs: Alergy, Drug intolerance, Drug addiction, drugs abuses and their biological effects.

Unit 5

Anaesthetics: General and local, gaseous anaesthetics, ether and vinyl ether,halogenated hydrocarbons like chlorofom, intravenous anaestheticsthropentanesodium and cocaine. Antispetics and disinfectants- Phenols and related compounds, formaldehyde and ethanol. Organic pharmaceuticals- their role as preservatives and food additives.

References

1. Principles of medicinal chemistry – W.O. Foye.
2. Pharmacology by Satoskar. A.
3. A text book of Pharmacology and Pharmacotherapeutics by R.S. Satoskar, S.D. Bandarkar Ainapure.

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Major Based Elective – II : ENDOCRINOLOGY

Unit 1

Hormones- definition, classification, biosynthesis and circulation in blood. Mechanism of hormone action. Plasma membrane receptors. Adenylate cyclase, Role of G-proteins. Protein kinases, tyrosine, kinase, Inositol phosphate. Calcium, calmodulin. Mechanism of steroid hormone receptors- Mechanism of action of steroid hormone.

Unit 2

Hormones of the thyroid Biosynthesis and biological actions of thyroid hormones. Antithyroid agents. Thyroid disease- thyrotoxicosis, Goiter, Grave's disease, Hashimoto's thyroiditis. Parathyroid hormone- Biological actions regulation of calcium and phosphorous metabolism. Calcitonin. Calcitriol- Biosynthesis and functions. Hyper and hypocalcemia. Hyperparathyroidism, hypoparathyroidism, Paget's disease. Ricket's and osteomalacia.

Unit 3

Hypothalamus and pituitary hormones

Vasopressin and oxytocin- synthesis and biological effects. Hypothalamic releasing factors. Anterior pituitary hormones- actions. Growth promoting and lactogenic hormones. Glycoprotein hormones the POMC family. Endorphins, MSH. Gigantism, Acromegaly, Dwarfism and Diabetes insipidus.

Unit 4

Pancreatic hormones- Insulin- Biosynthesis, regulation of secretion and biological actions. Mechanism of action of insulin. Glucagon, somatostatin and pancreatic polypeptide. Insulin like growth factors.

Unit 5

Adrenal hormones- Glucocorticoids, Mineralocorticoids- synthesis and biological effects. Catecholamines: biosynthesis and biological effects. Gonadal hormones- Androgens and estrogens. Ovarian cycle. Abnormal secretion of adrenal hormones- Addison's disease. Cushing's syndrome, congenital adrenal hyperplasia, phaeochromocytoma.

References

1. William's Textbook of Endocrinology – Wilson and Foster 8th edn.
2. Principles of Biochemistry – Mammalian Biochemistry – Smith et al. Mc Graw Hill 7thedn.
3. Mechanisms of hormone action – Autin and short.

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Major Based Elective – III: IMMUNOLOGY

Unit 1

The Immune system: Introduction: Primary and Secondary Lymphodoil organ, Lymphocytes, their origin and differentiation. Antigen presenting cells- macrophages, dendritic cells, langerhans cell, their origin and function. Mechanism of phagocytosis, identification of cell types of immune system, complement and their biological function-types of immune responses, immune tolerance.

Unit 2

Immunoglobulins: Structure of Immunoglobulins, antibody specificity, biological functions of immunoglobulins, generation of diversity. Types and characteristics of antigen. Antigen-antibody interactions, antitoxins, agglutination, complement system - opsonin, bacteriolysin and precipitation.

Unit 3

Immunity: Types of immunity- Innate immunity- surface barriers phagocytosis. Acquired immunity- active and passive. Antitoxic, antibacterial and antiviral immunity. Immune response.

Humoral and cell mediated immunity and their interaction. Lymphokines and interleukins-their role in immune response.

Unit 4

Immunity to infection: Hypersensitivity reactions: types of hypersensitivity, mechanism of T-cell activation, macrophage activation and granuloma formation. Transplantation-Immunologic response graft rejection mechanism and prevention of graft rejection, immuno suppressive drugs. HLA-immune response genes and diseasepathogenesis of auto immune diseases.

Unit 5

Immunochemical techniques. Production of antisera- the precipitation reaction, immunodiffusion, immunoelectrophoresis, immunofluorescence, complement fixation. Principle, technique and applications of RIA and ELISA. Hybridoma technology

References

1. Immunology – Ivan Roitt.
2. Immunology – Weir.
3. Immunology – Donald M. Weir, John Steward.
4. Essential Immunology – Ivan Roitt.
5. Immunology – Kuby 3rd ed Freeman, 1997.

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