MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES

B.Sc., Biochemistry

(Choice Based Credit System)
(with effect from the academic year 2017-2018 onwards)

Eligibility for admission to B.Sc., Biochemistry

Candidates shall be admitted to the course provided he / she has passed plus two examinations of the state or central board with biology / biochemistry as one of the subject.

Sem	Pt III/ IV/V/ VI	Sub No.	Subject status	Subject Title	Hrs/ week	Credits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	17	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	18	Language	English	6	4	25	75	100	30	40
	III	19	Core - 1	Enzymology	4	4	25	75	100	30	40
		20	Major Practical- III	Enzymes and Enzyme kinetics	3+	2	50	50	100	30	40
		21	Allied	Chemistry / Zoology	3	3	25	75	100	30	40
		22	Allied Practical-I		2+	2	50	50	100	30	40
		23	Skilled Based subject	Biochemistry diagnostic tools/Blood banking	4	4	25	75	100	30	40
	IV	24	Common	Yoga	2	2					
	V	25	Non-Major Elective (Select any one)	i) Biochemistry of Vision ii) Vaccinology	2	2	25	75	100	30	40
			Total		**30**						

IV	I	26	Language	Tamil/Other Language	6	4	25	75	100	30	40
	II	27	Language	English	6	4	25	75	100	30	40
	III	28	Core - 1	Intermediary metabolism	4	4	25	75	100	30	40
		29	Major Practical- IV	Isolation and Characterization of Biomolecules	3+	2	50	50	100	30	40
		30	Allied II	Zoology/ Chemistry	3	3	25	75	100	30	40
		31	Allied Practical- II		2+	2	50	50	100	30	40
		32	Skill Based Subject	Public health studies/Forensic analysis/DNA finger printing	4	4	25	75	100	30	40
	IV	33	Non-Major Elective (Select any one)	i) Nutritional Biochemistry ii) Chemical Biology	2	2	25	75	100	30	40
	V	34	Extension Activity	NCC,NSS, YRC, YWF	-	1	-	-	-	-	-
	VI	35	Common	Computers for digital Era	2	2	-	-	-	-	-
			Total		**30**						

V	I	36	Core - 1	Plant Biochemistry	5	5	25	75	100	30	40
	II	37	Core - 2	Clinical Biochemistry	5	5	25	75	100	30	40
	III	38	Elective - 1	Biostatistics/ Bioinformatics/ Diagnostic Biochemistry	4	4	25	75	100	30	40
		39	Elective - 2	Environmental Biochemistry/ Nutritional Biochemistry/ Microbial Biochemistry	4	4	25	75	100	30	40
		40	Practical –V	Clinical Enzymology	4	2	50	50	100	30	40
		41	Practical – VI	Clinical Biochemistry-I	4	2	50	50	100	30	40
		42	Practical – VII	Haematology	2+	2	50	50	100	30	40
	IV	43	Skill Based subject (Common)	Personality Development/ Effective Communication/ Youth Leadership	2	2	25	75	100	30	40
			Total		**30**						

VI	I	44	Core - 1	Molecular Biology	4	4	25	75	100	30	40
	II	45	Core - 2	Endocrine Biochemistry	4	4	25	75	100	30	40
	III	46	Core - 3	Immunochemistry	4	4	25	75	100	30	40
		47	Elective - 3	Biotechnology / Genomics and proteomics/ Drug biochemistry	4	4	25	75	100	30	40
		48	Practical -VIII	Clinical Biochemistry-II	2+	2	50	50	100	30	40
		49	Practical - IX	Immunology and Molecular biology techniques	3+	2	50	50	100	30	40
		50	Practical - X	Microbial techniques	2+	2	50	50	100	30	40
		51	Project	Group project	7	7	-	-	-	-	-
			Total		**30**						

III - SEMESTER

Course-5 – ENZYMOLOGY

L	T	P	C
4	0	0	4

Objective: To integrate the practical aspects of enzymology with the kinetic theory and a mechanistic overview of enzyme activity and regulation in cell

Total Hours : 60

Unit-1 12 Hours

Introduction to Enzymes

General characteristics of enzymes, enzyme specificity, Nomenclature, definition with examples of holoenzyme, apoenzyme, coenzymes, cofactors, activators, inhibitors, Unit of enzymes. Definition of IU, Katal, Enzyme turn over number and specific activity. Mechanism of enzyme action, Active site.

Unit-2
12 Hours

Enzyme kinetics

Factors affecting enzyme activity- enzyme concentration, substrate concentration, pH and temperature. Derivation of Michaelis Menton equation for uni substrate reactions. Km and its significance. Line weaver-Burk plot.

Unit-3
12 Hours

Enzyme inhibition

Reversible and irreversible inhibition, competitive inhibition, non-competitive inhibition and un competitive inhibition. Allosteric enzymes.

Unit-4
12 Hours

Cofactors in enzyme catalysis

Role of cofactors in enzyme catalysis NAD/NADP, FMN/FAD, Coenzyme ATP, Pyridoxal Phosphate, Tetrahydrofolate, Mechanism of action of chymotrypsin, lysozyme. Multienzyme complexes- pyruvate dehydrogenase complex.

Unit-5 12 Hours

Enzyme regulation

General mechanism, Feedback inhibition, Enzyme repression induction- Reversible and irreversible covalent modifications with specific examples. Immobilized enzymes and their industrial applications. Isoenzymes and their medical applications.

References

1. Principles of Biochemistry- Lehninger 3rd edition
2. Enzymes- Trevor Palmer
3. Principles of Biochemistry- B.L.Smith
4. Agarwal's text book of Biochemistry- Goel publishing house
5. Harper's Review of Biochemistry 24th edition
6. Text book of Biochemistry- Lubert Stryer 4th edition
7. Principles of Biochemistry- Emil L. Smith, Abraham White, Philip Handler- 7th edition.

MAJOR PRACTICAL 3: ENZYMES AND KINETICS

L	T	P	C
0	0	4	2

1. ASSAY OF AMYLASE –Effect of pH, Temperature,
   Enzyme concentration and Substrate concentration
2. ASSAY OF ACID PHOSPHATASE – Effect of pH, Temperature, Enzyme concentration and Substrate concentration
3. ASSAY OF ALKALINE PHOSPHATASE - Effect of pH, Temperature, Enzyme concentration
   and Substrate concentration

SKILL BASED COURSES IN BIOCHEMISTRY – SEMESTER III
(Select any one)

BIOCHEMICAL DIAGNOSTIC TOOLS

L	T	P	C
4	0	0	4

Objective: To introduce the basic concepts of medical and clinical biochemistry relevant to biotechnology, biomedical research and analysis of patient samples in a pathology laboratory.

Total Hours : 60

Unit- 1 12 Hours

General laboratory and Instrument maintenance

Organization of laboratory and safety precautions in laboratory and personal cleanliness and care with regards to infected materials and chemical burns. Quality assurance and disposal of wastes. Cleaning of equipments and glasswares.

Maintenance and use of refrigerator, deepfreezers, incubators, ovens, water bath, autoclaves, centrifuges, anaerobic chambers etc. Maintenance and knowledge of various components of microscopes and applications of various types of balances.

Unit- 2 12 Hours

Clinical Biochemistry and Clinical Pathology

Principle, types, uses, care & maintenance of Photoelectric colorimeter, spectrophotometer and flame photometer. Principle, types, uses of Autoanalyser, Blood Gas analyzer & role of computers in laboratory.

Specimen collection: Whole blood, plasma, serum, urine, C.S.F & other body fluids, anticoagulants.

Quality control: Role of quality control and its importance. Accuracy,Reliability, Precision.

Biochemical test profiles: Principle and examination of glucose tolerance test, liver function tests, kidney function tests, thyroid function test and lipid profile.

Physical and chemical examinations of urine and microscopic examination for crystals, cells and casts. Seman analysis (count, motility, abnormal forms etc.).

Unit- 3 12 Hours

Hematology

Collection of blood, preparation and use of different anticoagulant vials, preparation of blood smears, staining of blood film and mounting of slides.

Preparation of reagents for haemoglobin, counting of leukocytes, RBC, platelets and reticulocyte count, determination of ESR and PCV and techniques of these tests. Recognition of blood cells in peripheral blood smears.

Preparation of haemolysate and determination of foetal haemoglobin and haemoglobin electrophoresis, Preparation of reagents and techniques of coagulation profile, platelet profile.

Unit- 4 12 Hours

Microbiology

Cleaning and methods of sterilization of glasswares, media, instruments including syringes, needles and sharp instruments.

Preparation of media, plugging of test tubes, preparation of swap sticks, reagents, nutrient agar, blood agar, chocolate agar, Loeffer's serum, Dorsetts egg medium, L.J. medium, peptone water, sugar media etc.

Processing of sample for isolation of bacteria from blood, CSF, tissue, sputum, throat swab, wound swab, urine, pleural fluid, ascetic fluid, AFB culture etc. Drug sensitive tests.

Staining method: Gram stain, Ziehl-Nelsen stain, Albert's stain etc. Motility preparations, handing drop preparation, steps in bacterial identification of Cocci, Corynebacteria, Diptheria, Mycobacteria, Gram negative bacilli and Gram positive bacilli.

Unit-5 12 Hours

Principles and techniques of agglutination

Haemagglutination, Precipitation and Flocculation tests. Techniques of RA factor, CRP, ASO, VDRL, Widal. Principles of ELISA test and use of ELISA reader- TORCH, Auto Antibodies, Hepatitis, HIV testing and EBV etc. Principles and techniques of electrophoresis- Seperation of plasma proteins and Immunoglobulins by gel electrophoresis.

References

1. Clinical Chemistry in Diagnosis and tTreatment – Ziwa J.F.P Peter, Mayne P.D.
2. Practical Clinical Biochemistry – Varley Publications, W.H. Heinemann
3. A Biologist Guide to principle & techniques of Practical Biochemistry :- William & Wilson, Edward Arnold
4. Textbook of Biochemistry – Ramakrishnan Prasman & Rajan
5. Medical Biochemistry – M.N. Chatterjee, Shinde
6. Medical Biochemistry – Das
7. Clinical Laboratory Methods – John D. Benger
8. Clinical Diagnosis by Laboratory Examination, John A. Kokmer.
9. Textbook of Pathology, vol I & II – N.C. Dey
10. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D
11. Clinical Lab. Methods & Diagnosis, Vol I & II – Alex C, S L Garelt.
12. Clinical Lab. Methods – John D Benger, Pilip G. Achermann, Gelsaon Toro
13. Medical Laboratory Technology Vol I, II & III – Kanai. L. Mukherjee.

BLOOD BANKING

L	T	P	C
4	0	0	4

Objective: To launch extensive awareness programmes for blood banking services including donar motivation, so as to ensure adequate availability of safe blood.

Total Hours : 60

Unit-1 12 Hours

Blood

Composition of blood, Basic principle involved in Immunohaematology prior to blood transfusion, Collection of blood – requirements, preparation, Veinpuncture. Hemolysis and prevention. Separation of serum.

Unit-2 12 Hours

Collection of blood

Blood collection for transfusion, Changes in blood on keeping, Anticoagulants in blood bank, Prevention of blood – precautions, Blood containers – Blood bags – Safety in blood bags.

Unit-3 12 Hours

Blood groups

Human blood group system – A, B, AB, O, Sub groups – A1 and A2 – Percentage of different groups, (D) factor system. Principles and Methods of blood grouping and Rh typing- tube and slide methods. Group interaction.

Unit- 4 14 Hours

Blood transfusion

Types and identification of various blood transfusion, Universal donar/recipient. Donar selection, Compatibility test – importance, types and methods – major and minor. Interpretation of

compatibility test between all available donar and patient and reporting methods. Release of blood transfusion, Precautions to be followed.

Unit- 5 14 Hours

Screening procedures for blood transfusion

Screening procedures for blood transfusion – HbsAg, HCV, HIV (ELISA, Western blot tests), VDRL, TPHA, Identification of Malarial and filarial parasites and LD bodies (Principles and methods).

References

1. Clinical diagnosis and Management by laboratory methods by Henry Bernard, J., Sanford,T and Davidson, 2002. W.B. Saunders, New York.
2. Clinical Laboratory Methods and Diagnosis by Gradwohls, 2000. (ed) Ales C. Sonnenwirth and Leonard Jarret, M.D. B.I. publications, New Delhi.
3. Clinical Laboratory Medicine by Richard. R , 1989 Medical public., Chicago
4. Haematology by Williams and J. William, 1990 Mc Graw Hill, New York.
5. Medical Laboratory Technology Vol. I, II & III – Kanai .L. Mukherjee.

NON MAJOR ELECTIVE COURSES IN BIOCHEMISTRY – SEMESTER III
(2017 onwards) select (Any one)

Biochemistry of vision

L	T	P	C
2	0	0	2

Objective

- To enable students to acquire specialized knowledge about Human eye.
- To study about role of vitamins & process of vision.
- To learn about the biochemical function of eye & their clinical disorders.

Total Hours :36

Unit- 1

Introduction, The Human eye – Anatomy - Cornea, Sclera , Choroid , Ciliary body, Iris ,Retina, Aqueous humor , Lens, Vitreous body, Structure and function of cones and rods.

Unit – 2

Process of vision: Role of vitamins- Vitamin A and retinoic acid , Vitamin C and Vitamin E in eye function. Retinol transport, metabolism and function, Lens proteins – Collagen, laminin, fibronectin, crystalline and proteogl;ycan.Arachidonic acids and Eicasanoids.

Unit – 3

Retinal pigments and phototransduction mechanism – second messengers – adenylatecyclase system, phosphoinositide breakdown, Guanylatecyclase and ANF.

Unit - 4

Biochemical composition of lens, retina,vitreous and tears. Metabolism of carbohydrates in the lens, cornea and retina. Glucose transport, insulin and aldosereductase.Glutathione metabolism in the lens.

Unit – 5

Clinical disorders- Keratoconjunctivitis, Mucin deficiency diseases, corneal dystrophies, Mucopolysacharidoses and Mucolipidoses , Aging and Cataracts, Sugar cataracts, Radiation cataracts and Selenium cataract and their risk factors, Glaucoma.

References

1.Garrett and Grisham's textbook of Biochemistry , updated 3rd edition.
2.Nelson, DL and Cox ,M.M Lehninger, Principles of Biochemistry (4thed, Freeman, 205)
3.Text book of Biochemistry – white Handler and Smith.
4. Text book of Anatomy – Guyton
5. Clinical chemistry – Teity and Co
6.Text book of Biochemistry – Lubertstryer 4th edition
7. Donald Voet,J.G.Voet, John Wiley, Biochemistry , 1995.

8. Biochemistry of the eye By Elaine R.Berman. Published by Springer, 1991
ISBN 0306436337, 978030646338 (www.springer .com)
9.Biochemistry of the eye DavidWhikehart, University of Alabama at Birmingham, AL, USA aperback, Butterworth Hainemann (www.elsevier .com)
10. Human eye physiology by Vaclav Hlavac(www.sight savers.org)

VACCINOLOGY

L	T	P	C
2	0	0	2

Objective

- To learnabout basic concepts of immunity & infection
- To study about the different types of vaccine.
- To acquire knowledge about recombinant vaccines

Total Hours :36

Unit – 1

Introduction on infection and immunity, sources of infection and infectious diseases, Immunity-innate and acquired immunity prevention of infectious diseases – vaccines – Historical aspects – Edward Jenner, cowpox and small pox vaccine Louis Pasteur and anti rabies vaccine.

Unit- 2

Types of vaccines – Live attenuated, killed, subunit,antitoxins , Antivenom, nucleic acid (DNA) vaccines. Currently licensed vaccines- Recombinant delivery systems for future vaccines- New approaches for better vaccines , Anti- idiotypic vaccines – Adjuvants.

Unit – 3

Practices of immunization therapeutic principles - new approaches to immunization - mucosal vaccine, maternal immunization. National immunization schedule for pregnant women , neonatal and children recommended by WHO.

Unit- 4

Recombinant vaccines ; polynucleotide as vaccines; biosynthetic and chemically synthesized vaccines; subunit vaccine; anti idiotype Vaccine ; fusion vaccines; mixed particle vaccines; human mucosal vaccine; combination vaccines; Edible vaccines produced in transgenic plants and microencapsulation.

Unit – 5

EPI vaccines – production of tetanus toxoid , diphtheria toxoid , pertussis vaccine, BCG vaccines; preparation of Hepatitis B vaccine rabies vaccine and AIDS vaccine.

References

1. Roitt et al .Roitt'sEssential immunology .10thed.Blackwell sci.2001.
2. Richard A Goldsby et al.Kuby immunology.4thed.WH Freeman & Co.2003

3. Abbas et al, cellular and Molecular immunology W.B Sauderscompay, 2000
4. Janeway, c.(Ed), paul Travers. Immunology 5th ed. Garland publ.2001
5. Eli Benjamini AU et al. immunology 5thed.Garland publ.2001
6. NMS series in immunology 3rded .LippncottWillamsand Wilkins.
7. Bier et al, Fundamentals of immunology, Springer verlag, 1986

SEMESTER- IV

Course-6 METABOLISM

L	T	P	C
4	0	0	4

Objective: To recognize outstanding scientists for their efforts relating to metabolism research.

Total Hours : 60

Unit-1 12 Hours

General introduction to metabolism

Carbohydrates metabolism – glycolysis, oxidation of pyruvate to acetyl coA. TCA cycle, Bioenergetics, Cori's cycle, metabolism of hexoses- galactose, fructose, mannose, pentose phosphate pathway, Glyoxalate pathway, Glycogen metabolism, Glucuronate pathway, gluconeogenesis.

Unit-2 12 Hours

Lipid metabolism.

Oxidation of fatty acid- α, β and ω oxidation, β-Oxidatin, role of carnitine in β-oxidation. Biosynthesis of fatty acid- saturated fatty acid- synthesis of palmitic acid, Unsaturated fatty acid – synthesis of linolenic acid, linoleic acid and palmito oleic acid, biosynthesis of triacylglycerol, biosynthesis of phospholipids, biosynthesis of cholesterol.

Unit-3
12Hours

Bioenergitics

Laws of thermodynamics and concepts of free energy, enthalpy and entropy. High energy phosphate compounds and significance of ATP. Electron transport chain and its significance, inhibitors of ETC, oxidative phosphorylation- chemiosmotic theory, site of oxidative phosphorylatin, P/O ratio, inhibitors and uncouplers of oxidative phosphorylation.

Unit-4 12 Hours

Aminoacid metabolism

Transamination, deamination and decarboxylation of aminoacids. Metabolism of non-essential aminoacids – tyrosine, phenylalanine, Urea cycle. Integration of carbohydrate, lipid and protein metabolism, ketogenesis.

Unit-5
12Hours

Nucleotide metabolism

purine and pyrimidine biosynthesis and degradation.

References

1. Principle of Biochemistry- Lehninger 3rd edition
2. Biochemistry- David Rawn
3. Principles of Biochemistry- B.L.Smith
4. Agarwal's text bok of Biochemistry- Goel publishing House
5. Harper's Review of Biochemistry- 24th edition
6. Text book of Biochemistry- Lubert Stryer 4th edition
7. Principles of Bichemistry- Emil L. Smith, Abraham White, Philip Handler- 7th edition.

MAJOR PRACTICAL-4: ISOLATION AND CHARACTERIZATION OF BIOMOLECULES

L	T	P	C
0	0	4	2

1. Isolation and Estimation of DNA (Animal tissue)
2. Isolation and estimation of RNA from yeast
3. Estimation of iron from Plant sources
4. Estimation of Protein from Soya bean
5. Estimation of Carbohydrates from Wheat
6. Estimation of calcium from milk
7. Estimation of Vitamin C from Citrus Fruits
8. Estimation of fructose from fruit.
9. Separation of aminoacids by paper chromatography
10. Separation of plant pigments by column chromatography

References

1. Laboratory Manual in Biochemistry- T.N. Pattambiraman -3rd edition
2. Laboratory Manual in Biochemistry – J. Jayaraman, New Age International Publishers
3. Biochemical methods – S. Sathasivam and , A. Manicham, New Age International Publishers
4. An Introduction to Practical Biochemistry – David . T Plummer – 3rd edition

SKILL BASED COURSES FOR B.Sc. BIOCHEMISTRY - SEMESTER IV

(Select any one)

PUBLIC HEALTH STUDIES

L	T	P	C
4	0	0	4

Objective: To pursue a career working in community and public health programs and education in voluntary, private and governmental agencies.

Total Hours : 60

Unit- 1 12 Hours

Concept of health and diseases

Preventive Medicine, Social Medicine, Definition of health, Dimension of health, Spectrum of health, Determinants of health and Indicator of Health. Natural history of disease, concept of disease control, levels of prevention and modes of intervention for diseases and condition, International classification of diseases and coding system.

Unit- 2 12 Hours

Principles of epidemiology and epidemiologic methods

Aims of epidemiology, epidemiological approaches, rates and ratios, measurements of mortality, measurement of morbidity. Epidemiology of communicable diseases - Small pox, chicken pox, influenza, diphtheria, Whooping cough, tuberculosis, Dengue, Malaria, Filariasis, Rabies, Plague, Japanese Encephalitis, Leishmaniasis, Leprosy, Sexually transmitted diseases and Acquired Human immunodeficiency syndrome.

Unit-3 12 Hours

Nutrition and Health

Concept of balanced diet. Common Nutritional deficiency disorders, Assessment of Nutritional status, Social aspects of Nutrition. Nutrition surveillance, Food hygiene, Milk hygiene, Meat hygiene, Food borne diseases, Community Nutrition Programmes, Diets in disease condition like Diabetes and hypertension

Unit- 4 12 Hours

Demography & Family planning

Demographic cycles, Demographic trends, fertility, National Health Policy, National Population policy, Contraceptive methods and its evaluation.

Health education and communication: Health education objectives contents, principles, communication in health education, Audio Visual, AIDS, Practice of Health education, Counselling process.

International Health agencies: WHO, UNICEF, Voluntary Health Agencies

Unit- 5 12 Hours

Health Programmes in India

Health Planning and Management: Health Planning Objectives, planning cycle, Management process methods and techniques, Health system in India, Evaluation of Health Services, Planning for a Health programme in a community, monitoring and supervision and ethics.

References

1. Park. K. Textbook of preventive and Social medicine. Jabalpur: Banarsidas Bhanot
2. Public health and preventive medicine - John M. Last
3. Textbook of public health - Hollance
4. Yash Pal Bedi, A, Handbook of Social and Preventive Medicine: Atma Ram and Sons
5. O.P.Ghai and Piyush Gupta- Essential preventive Medicine. 'Vikas publishing House Pvt. Ltd'.

FORENSIC ANALYSIS

L	T	P	C
4	0	0	4

Objective: Too provide assistance in the development of forensic science in particular by encouraging case work good practice through targeted events.

Total Hours : 60

Unit-1 12 Hours

Forensic Science

Definition, History and Development.2Crime scene management and investigation; collection, preservation, packing and forwarding of physical and trace evidences for analysis

Unit-2 12 Hours

Blood

Fresh blood – grouping and typing of fresh blood samples including enzyme types.

Analysis of stains of blood and allied body fluids for their groups and enzyme types.

Cases of disputed paternity and maternity problems, DNA profiling

Unit- 3 12 Hours

Analysis of body fluids

Analysis of illicit liquor including methyl and ethyl alcohol and alcohol in body fluids and breathe.

Analysis of petroleum products. Chemical examination, physiology and pharmacology of Insecticides and pesticides.

Unit- 4 12 Hours

Psychotropic drugs

Sedatives, stimulants, opiates and drugs of abuse.Extraction, isolation and identification of poisons from viscera, tissues and body fluids.

Unit- 5 12 Hours

Identification tests

Identification of hair, determination of species origin, sex, site and individual identification from hair.

Classification and identification of fibers.Examination and identification of saliva, Urine, faecal matter and milk. Examination and identification of semen stains including the species origin and individual characteristics.

References

1. An Introduction to Forensic DNA Analysis by Norah Rudin & Keith Inman USA, Second edition.
2. Forensic Science Handbook, Volume 2 & 3 by Saferstein, Richard E.
3. Forensics by Stewart Gail B
4. Forensics by Embar-Seddon, Ayn and Pass. Allan D.
5. Forensic Medicine by Adelman, Howard C & Kobilinsky, Lawrence

DNA FINGER PRINTING

L	T	P	C
4	0	0	4

Objective: To promote the use of DNA technology in various areas relating to social welfare including crime and civil matters, plant and animal stock improvement, certification of cell lines, detection, prevention and treatment of diseases.

Total Hours : 60

Unit- 1 12 Hours

Molecular basis of life

An introduction. Experimental Proof of DNA and RNA as genetic material.

Structure and functions of DNA and RNA. Watson and Crick model of DNA and other forms for DNA (A and Z). Functions of DNA and RNA including ribozymes.

Unit- 2 12 Hours

Introduction of Genetic engineering.

Tools for genetic engineering, DNA manipulative enzymes – Restriction enzymes and DNA Ligases. Gene cloning vector – Plasmids, Bacteriophage and cosmids. Isolation of plasmid DNA (E.coli), Restriction digestion of DNA's.

Gene Libraries – Genomic DNA and cDNA cloning techniques, expression of cloned DNA in E.coli. separation of DNA by Agarose Gel Electrophoresis and SDA-PAGE, Polmerase chain reaction (PCR)

Blotting techniques – Southern, Western and Northen blot. Nucleic acid sequencing - Sanger's method.

Unit- 3 12 Hours

DNA finger printing

History, Evolution of term finger printing- Global and Indian scenario. Principle of DNA finger printing. Technological developments in DNA finger printing.

Tools for DNA Finger printing: Minisatellite based, Micro satellite based, SNP based techniques for DNA finger printing, Single locus to Multilocus, Singleplex to Multiplex.

Low through put to High throughput

Unit- 4 12 Hours

Application of DNA

Application of DNA in finger printing History, Agriculture, Veterinary, Medicines, Forensics, Ecology, Conservation.

Unit- 5 15 Hours

Critical issues in DNA fingerprinting

Genetics issues, Technical issues, Statistical issues. Case studies: Historic cases, erratic cases. Application oriented case studies. Critical issues related case studies.

References

1. Glick, B.T and Pastermak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA, Washington D. C. ASM press.
2. Howe, C. (1995) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press
4. Rigby, P.W.J. (1987) Genetic Engineering Academic Press Inc., Florida, USA
5. Sambrook et al (2000), Molecular cloning volumes I, II & III, Cold spring Harbor Laborator Press, New York, USA
6. Walker J.M and Gingold E. B (1983) Molecular Biology and Biotechnology (Indian Edition), Royal Society of Chemistry, U.K
7. Karp G. (2002) Cell & Molecular Biology, 3rd edition, John Wiley and Sons inc
8. Christopher H. (1995), Gene cloning and manipulating, Cambridge University Press
9. Nicholl D.S.T (1994) An Introduction of Genetic engineering, Cambridge University Press
10. Old R.W and Primrose S.B. (186) principles of Gene manipulation, An introduction to Genetic Engineering (3rd edition) Black Well Scientific Publications
11. Watson J.D. Hopins, N.H. Roberts, J.W. Stectz J.A and Weiner A.M (1988). Molecular biology of society for Microbiology.
12. DNA fingerprinting: state of the science by Sergio D.J . Pena, Birkhauser 1993.
13. Genomic diversity: applications in human population genetics by Surinder Singh Papiha, Ranjan Deka, Ranajit Chakraborty: Springer, 1999.

NON MAJOR ELECTIVE COURSES IN BIOCHEMISTRY – Semester IV
(Selectany one)
NUTRITIONAL BIOCHEMISTRY

L	T	P	C
2	0	0	2

Objective

To acquire knowledge the biological basis of nutrition and the mechanisms by which diet can influence health

Total Hours :36

Unit – 1

Introduction and definition of food and nutrition, Function of foods and its relation to nutrition and clinical health, essential nutrients,analysis of food composition, food groups.

Unit – 2

Physiological role, nutritional significance and food sources of carbohydrates, fats, proteins, minerals (Calcium, phosphorous, sodium and potassium) and trace elements (Copper .Cobalt, Zinc, Iodine and iron)

Protein malnutrition (kwashiorkor) and under nutrition (marasmus)

Unit- 3

Vitamin- definition, classification, sources, absorption, daily requirements, metabolism, physiology, nutritional significance and deficiency. RDA for infants, children, adolescents (male and female) pregnant & lactating women and old age.

Unit – 4

Measurement of food stuffs by Bomb calorimeter. Calorific values of proteins, carbohydrates and fats. Energy – basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature , energy needs, total energy requirement .

Unit – 5

Food production, food storages, functional foods , new protein foods , new fat foods and changing food habits. Food adulteration and Hygiene.

References

1. Principles of nutrition and dietetics. M. Swaminathan
2. Normal and therapeutic nutrition – Corine Robinson
3. Human nutrition and dietetics – Davidson and Passmore
4. Food nutrition and diet theraphy – Krause and Hunscher
5. Advanced text book o food and nutrition – M.Swaminathan(Vol.1 & 2)

Chemical Biology

L	T	P	C
2	0	0	2

Objective

- To learn about the basic structures & concepts of biomolecules.
- To acquire depth knowledge enzymes and proteins.

TotalHours:36

Unit- 1

Structure and function of Macromolecules (Nucleic acids, carbohydrates and lipids) and their building blicks: amino acids , purine and pyrimidine bases, fatty acids and sugars.

Small molecules of biological importance: vitamins and minerals.

Unit :2

Enzymes:classification, catalysis, kinetics, activation and inhibition.coenzymes and cofactors, andtheir relevant reactions, Allosteric enzymes.

Unit – 3

Proteins: Classification, structure and function. Primary, secondary, Tertiary and Quaternary structure. Physical methods to study protein folding.

Unit – 4

Chemical approaches to study protein functions (mutagenesis, foldamer,unnatural amino acid incorporation , solid phase peptide synthesis, non – ribosomal peptide synthesis), proteomics-Kinases andphosphatases. Post translation modifications.

Unit – 5

Chemical biology applications: Bio – imaging (GFP, metal detection) nucleic acid catalysis, catalytic antibodiesCell surface glycoproteins, engineered polyketidesynthases, DNA – templatesynthesis.

References

1.Biochemistry by Donald Voet and Judith G.Voet , 3rd edition 2004.

2.Proteinstructure and function by George A.Petsko.

3. Nelson, DL and Cox ,MM Lehninger, principles of Biochemistry (4thed, Freeman, 2005)

4. Structure and Mechanism in protein science, Fersht, A.3rd edition 1999

5. Bioorganic chemistry ,Dugas, H.,3rd edition 1996

6. Mechanism in protein chemistry, Kyte,J., 1st edition 1995

7.Principles of Bioinorganic chemistry ,Lippard, S.J.& Berg, J.M.1994.

SEMESTER- V

Course-7: BC151 – PLANT BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To introduce the students to the biochemistry of plant development.

Total Hours:60

Unit-1 12 Hours

Photosynthesis

Ultra structure of chloroplast- photosynthetic pigments, Light reaction, photo system I & II. Electron transport- photo phosphorylation.

Unit-2 12 Hours

Metabolism

CO_2 fixation and reduction- C3 plants (calvin cycle), C4 plants (Hatch-Slack pathway), CAM plants (crassulacean acid metabolism), photo respiration.

Unit-3 12 Hours

Nitrogen fixation

Nitrogen and Sulphur metabolism- Biochemistry of nitrogen fixation- nitrogenase, nitroreductase, nitrate reductase. NIF genes, nitrate assimilation. Sulphate activation- reduction and sulphite reduction.

Unit-4 12 Hours

Plant growth regulators

Plant growth regulators- chemistry, synthesis, physiological role of auxin, Gibberlin, Cytokinin, Ethylene and Abcissic acid.

Unit-5 12 hours

Seed germination and dormancy

Physiological and, biochemical changes, factors affecting seed germination and dormancy (water, light, temperature, salinity, stress). Photoperiodism- phytochrome- vernalization.

References

1. Plant biochemistry- Goodwin and mercer
2. Plant physiology- Devlin
3. Biochemistry for agricultural sciences, B. Thayumanavan et al., 2004
4. Plant physiology- F.B. Salisbury and C.W. Ross (4^{th} ed)
5. Plant biochemistry- Geza Doby.

Course -8-CLINICAL BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To give all students regardless of their professional laboratory background, a comprehensive understanding of the principles of clinical biochemistry.

Total hours : 60

Unit-1 12 hours

Disorders of carbohydrates metabolism

Regulation of blood glucose level, hypoglycemia, hyperglycemia, diabetes mellitus-types, Clinical features, diagnostic tests- blood and urine tests, Benedict's method, glucose tolerance test, renal threshold for glucose, glycogen storage diseases, lactosuria, ketonemia and ketonuria.

Unit-2 12 hours

Disorders of lipid metabolism.

Plasma lipids and lipoproteins- Hyper lipoproteinemia – types, LCAT deficiency, Hyper and hypo Cholesterolemia, lipidosis, Xanthomatosis, atherosclerosis and fatty liver.

Unit-3 12 Hours

Disorders of amino acid metabolism and protein abnormalities

Inborn errors of aminoacid metabolism- cystinuria, phenylketonuria, maple syrup urine disease, albinism, Hartnup's disease, Willson's disease, Gout, hypouricemia

Disorders of protein metabolism- proteinuria, fibrinogen, albumin, globulin and A/G ratio.

Unit-4
12 Hours

Function tests

Liver and kidney function tests. Jaundice- types, clinical features, diagnostic tests- Vandenberg, fouchet's, Hay's test, test for urobilinogen. Renal clearance – urea, uric acid and creatinine. Renal blood flow . Pancreatic function test.

Unit-5 12
Hours

Enzymes in clinical diagnosis,

Isoenzymes- LDH, CPK, AST, ALT, Alkaline phosphatase, acid phosphatase, choline esterase, amylase, lipase. Electrophoretic pattern of isoenzymes in myocardial infarction, liver and muscular diseases.

References

1. Text book of Medical Biochemistry- M.N.Chaterjee and Rane Shinde
2. Biochemistry with clinical correlation – Devlin
3. Clinical Biochemistry – William Hoffman
4. Practical Clinical Biochemistry – Harold Varley
5. Textbook of Medical Biochemistry – S.Ramakrishnan, K.G. Prassanan and R.Rajan
6. Harper's Biochemistry 24th edition
7. Clinical chemistry – Teity and Co.

ELECTIVES (MAJOR)

ELECTIVE – I (Select any one from the three)

(Semester- V)

BIOSTATISTICS

L	T	P	C
4	0	0	4

Objective: To advance statistical science and its application to problems of human health and disease, with the ultimate goal of advancing statistics.

Total Hours: 60

Unit-1 12 Hours

Data collection

Primary and secondary data; organization of data- Editing, classifying and tabulating. Frequency distribution. Diagrammatic representation of data - Diagrams, graphs and charts.

Unit-2 12 Hours

Measures of central tendency

Mean- Arithmatic mean, Geometric mean, Harmonic mean, Median and Mode.

Unit-3 12 Hours

Measures of Dispersion

Range, Standard deviation, Mean Deviation, Quartile deviation, Coefficient of variation.

Unit-4 12 Hours

Probability

Addition and Multiplication theorems, Theoretical distribution- Binomial poisson and Normal distributions.

Unit-5 12 Hours

Sampling theory-

Population sample, Sample size, Sampling distribution, Standard error, Types of sampling, students t- Test, ANOVA (elementary level).

References

1. Text book of Subsidiary Statistics – K. Ramakrishna Pillai – Published by V.R. Pillai, Srinivas, Arunapuram Palani.
2. Statistical Methods – S.P. Gupta
3. Biostatistics – A foundation for analysis in health science, Daniel
4. Biostatistics analysis ,Zar J.H, 1984, Prentice Hall, New Jersey.

BIOINFORMATICS

L	T	P	C
4	0	0	4

Objective: To provide a national bioinformation network design to bridge the interdisciplinary gaps in biotechnology information.

Total Hours : 60

Unit-1 12 Hours

Basic principles of computing

Hardware (CPU, monitor, keyboard), Running computer software. Operating systems (Windows, DOS, Unix, Linux), Internet- software downloading and installations, useful packages, Database management, Useful bioinformatics sites on the www.

Unit-2
12 Hours

Biological databases

Content, structure and annotation, file formats, Types of databases, Network and databases. Annotated sequence databases.

Genome and organism specific databases. Retrieval of biological data. Retrieval with Entrex, DBGET, Sequence retrieval system.

Unit-3
12 Hours

Searching sequence data bases.

Sequence similarity search tools, Aminoacid substitution. Search tools – FASTA and BLAST, PSI – BLAST.

Multiple sequence alignment and family relationships. Protein families and pattern databases. Protein domain families.

Unit-4
12 Hours

Phylogenetics

Building phylogenetic tree, evolution of Macromolecular sequences.

Unit-5
12 Hours

Gene prediction Methods

Tools of gene prediction, sequence annotation, Principles of genome annotation, Annotation tools.

Microarray data analysis- Proteomics Data analysis, 2D gel. Metabolic pathway and pathway stimulation. E – cell structural Bioinformatics- Protein structure database and visualization tools, Structural alignment, Protein structure prediction methods, Protein function predictions.

References

1. Bioinformatics concepts, skills and applications – S;C. Rastogi, N. Mendirattar and Y. Rastogi, CBS. Publishers, New Delhi.
2. Bioinformatics – Westhead, Parish and Twynan – BioScientific Publishers, Oxford.
3. Introduction to Biinformatics, A. Krawetzt
4. Bioinformatics, A theoretical and practical approach – D.D. Womble, Human Press.

DIAGNOSTIC BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To enable students to acquire specialized knowledge and understanding of selected aspects by means of a research project.

Total Hours : 60

Unit-1 12 Hours

Clinical chemistry tests

Blood group, glycosylated haemoglobin, fructosamine, GTT, uric acid, Ca, P, Fe, Cu, CSF analysis.

Unit-2 12 Hours

Enzymes

Acid phosphatases, LDH, CPK, CPK_MB, Alpha amylase, Hormones- T3, TSH, LH. Immunoglobulins- IgA, IgM, IgE.

Unit-3 12 Hours

Serodiagnostic procedures

Precipitation tests, VDRL test, Vidal test, (Slide and tube method) Brucella agglutination test, ASO test, RA test, CRP test.

Complement fixation test, skin test- Montaux test, Lepramin test.

Unit-4 12 Hours

Urine Analysis

Complete haemogram, complete urine analysis, complete motion analysis, seman analysis.

Unit-5 12 Hours

Blood Analysis

Blood bank, blood group and Rh factor, Coomb's test, Coagulation studies, Prothrombin test (PT), Partial PT, Plasma fibrinogen.

Test for amino acidurias- Test for phenyl ketonuria, DNPH, Test for keto acids, sodium nitroprusside test for Cystinuria and homocysteine.

References

1. Varley.H (1985), Practical Clinical Bichemistry, IV Edition
2. Tietz. N (1982), Fundamentals of Clinical Chemistry, W.B. Saunders Company
3. Jacqes Wallach (1982), Interpretation of Diagnostic test – A Synopsis, V Edition, Little Brown and Company.
4. Jone Zilva & Pannall.P.R. , Clinical Chemistry, Diagnosis and treatment, PG Publishing Pvt. Ltd.

ELECTIVE – II

(Select any one from the three)

ENVIRONMENTAL BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To acquire broad knowledge of the field of environmental chemistry including development of methods for ultra trace analysis of pollutants.

Total Hours : 60

Unit-1 12 Hours

Introduction- Concept and scope of Environmental Biochemistry

Nutrient cycling- Hydrogen cycle, Oxygen cycle, Nitrogen cycle, Carbon cycle, Phosphorus cycle, Sulphur cyc le and mineral cycle.

Unit-2 12 Hours

Water

Hydrological cycle, Water resources, Pathways and rate of waste releases to water. Eutrophication, water sanitation, Water purification, Analysis of drinking water, quality of drinking water. Recycling and Reuse of Water- desalination.

Unit-3 12 Hours

Lithosphere

Soil formation, composition of soil, soil air, soil water, micro and macro nutrients. Types of pollutants in soil – classification, characteristics, ill effects, disposal methods. Acid base and ion exchange reactions in soil.

Unit-4 12 Hours

Atmosphere

Atmosphere structure- composition of atmosphere, chemical and photo chemical reactions in the atmosphere. Types of pollutants in atmosphere – oxides of nitrogen, oxides of sulphur, oxides of carbon, ozone, organic gases with specific reference to Green house effect and ozone depletion, photochemical smog.

Unit-5 12 Hours

Chemical toxicology

Toxic chemicals present in the environment, impact of toxic chemicals on enzymes. Biochemical effects of pesticides, carcinogens and detergents.

Radiation pollution- causes, ill effects, protection, control of radiation pollution. Safety methods of disposal of radioactive wastes.

Thermal pollution- causes, ill effects, control of thermal pollution

Noise pollution- causes, ill effects, control of noise pollution

References

1. Hand book f Environmental Biochemistry, VOL-3, by Hutzinger, 1980.
2. The teachers hand book of Environmental studies by Perry 1974, Blandford press
3. Advantages in ecology and Environmental sciences by Mishra
4. Environmental chemistry – Sharma
5. Environmental chemistry – 4^{th} Edn. – A. K. De
6. Fundamendal Ecology – Eugene P . Odum
7. Fundamentals of Environmental Biology – K. C. Agarwal
8. Water and waste water technology – Mark J. Hammer , – Mark J. Hammer , Jr.
9. Water and waste water analysis – S. N . Kaul and A. Gautam
10. Water studies – M. Sunil Kumar and S. Ravindra Nath.

NUTRITIONAL BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To acquire knowledge regarding the biological basis of nutrition and the mechanisms by which diet can influence health.

Total Hours :60

Unit-1 12 Hours

Introduction and definition of food

Introduction and definition of food and nutrition, Function of foods, essential nutrients, analysis of food composition, food groups, food habits.

Unit-2 12 Hours

Food sources

Sources of carbohydrates, fats, proteins, minerals (calcium, phosphorus, sodium and potassium) and trace elements (copper, cobalt, zinc, iodine and iron)

Protein mal nutrition (Kwashiorkor) and under nutrition (marasmus)

Unit-3 12 Hours

Vitamins

Vitamins- definition, classification, sources, daily requirements, metabolism, nutritional significance and deficiency.

Composition of balanced diet and RDA for infants, children, adolescents (male and female), pregnant and lactating women and old age.

Unit-4 12 Hours

Measurement of food stuff

Measurement of food stuff by Bomb colorimeter. Calorific values of proteins, carbohydrates and fats. Energy – basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature, energy needs, total energy requirements.

Unit-5 12 Hours

Nutritional challenges

Nutritional challenges in future: food production, food storages, functional foods, new protein foods, new fat foods and changing food habits. Food adulteration and hygiene.

References

1. Principles of nutrition and dietetics – M. Swaminathan
2. Normal and therapeutic nutrition – Corine Robinson
3. Human nutrition and dietetics – Davidson and passmore
4. Food nutrition and diet therapy – Krause and Hunscher
5. Advanced text book on food and nutrition – M. Swaminathan (vol 1& 2)

MICROBIAL BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To learn the morphology and genetics of microscopic organisms like bacteria, viruses etc., in detail

Total Hours : 60

Unit-1 12 Hours

General introduction to microorganism

Scope and classification of micro organisms- bacteria, archaebacteria, Algae, fungi, protozoa and viruses. Bacterial cell- structure and morphology. Growth of microorganisms- nutritional requirements and physical conditions. Cultivation of bacteria- types, Bacterial growth curve, growth media- types. Isolation and maintenance of pure culture.

Unit-2 12 hours

Methods of microbiology

Enumeration of micro organisms. Staining methods- types. Microscopy - principles and applications of light, phase contrast, fluorescence and electron microscopy.

Unit-3 12 Hours

Viruses and Bacteriophages

General characteristics, structure and classification. Bacteriophages - lytic and lysogenic cycle. Animal viruses of special interest- Retro viruses (eg. HIV), Influenza virus, Tumour viruses. Plant viruses eg. TMV virus.

Unit-4
12 hours

Metabolism of microorganisms

Aerobic metabolism – uptake of nutrients into the cell – Active transport, facilitated diffusion and group translocation. Catabolism and Anabolism of hexoses, aminoacids, nucleotides and lipids, Polymerisation and Assembly.

Anaerobic metabolism- fermentation- ATP regeneration, Electron transport, denitrification, nitrate reduction, hydrogen sulphide formation.

Unit-5
12Hours

Applications of microorganisms

Alcoholic fermentation by yeast and bacteria, Formation of methane, citrate, succinate, lactate, vinegar, cheese and wine. Anaerobic fermentation - production of acetone, butanol. Aerobic fermentation- production of antibiotics, aminoacids and enzymes.

References

1. Microbiology- Presscot
2. Introduction to Micrbiology – John. L. Ingraham, Catherine A. Ingraham. 3rd edition
3. Microbial Ecology – Atlas and Bartha
4. Microbiology – Pelcar
5. Text book of Microbiolgy - Jayarman Panicker

PRACTICAL- 5: BC 1P5 – CLINICAL ENZYMOLOGY

L	T	P	C
0	0	4	2

Assay of the serum enzyme activity of

a. Alkaline phosphatase
b. Acid phosphatase
c. Aspartate transaminase
d. Alanine transaminase
e. Lactate dehydrogenase
f. Amylase
g. Arginase
h. Trypsin

References

1. Methods in Enzymology, Dixon & Web
2. Modern Experimental Biochemistry
3. Biochemical Methods – S. Sadasivam and A. Manikam

PRACTICAL-6: BC1P6 - CLINICAL BIOCHEMISTRY –I

L	T	P	C
0	0	4	2

Blood analysis

1. Estimation of blood sugar by King and Astoor method
2. Estimation of blood urea by DAM method
3. Estimation of serum uric acid by Caraway method
4. Estimation of serum calcium by titrimetric method
5. Estimation of serum iron by Ramsay method
6. Estimation of serum phosphorus by Fiske and Subbarow method
7. Estimation of serum protein and A/G ratio by Biuret method
8. Estimation of serum cholesterol by Zak's method
9. Estimation of serum Creatinine by Jaffey's Alkaline Picrate method.
10. Estimation of phospholipids
11. Estimation of triglycerides

References

1. Laboratory Manual in Biochemistry – T.N. Pattambiraman- 3rd edition
2. Laboratory Manual in Biochemistry – J. Jayaraman, New Age International Publishers
3. Practical clinical Biochemistry – Harold Varley, 4th edition.

L	T	P	C
0	0	4	2

PRACTICAL- 7: B C 1P7- HAEMATOLOGY

1. Identification of blood group
2. Differential count of leukocytes
3. Enumeration of RBC
4. Enumeration of WBC
5. Enumeratin of blood platelets
6. Determination of Erythrocyte sedimentation rate
7. Estimation of haemoglobin by Drabkin's method
8. Compatability test (Major and Minor Cross matching)
9. Determination of Packed Cell Volume (PCV)
10. Determination of bleeding time and clotting time

References

1. Basic Medicall Laboratory Techniques – Estridge, Reynold and Walter- 4th edition
2. Medical Lab Technology- Kanai L Mukherjee
3. Medical Lab Technology – Ramnik Sood
4. Laboratory manual in Biochemistry – T.N. Pattabiraman 3rd edition

SEMESTER- VI

Course-9: MOLECULAR BIOLOGY

L	T	P	C
4	0	0	4

Objective: To provide depth knowledge of biological and medicinal processes through the investigation of the underlying molecular mechanisms.

Total hours : 60

Unit-1
12Hours

Eukaryotic genome organization

Structure of Chromatin, coding and non coding sequences, satellite DNA), DNA- The genetic material- Experimental evidences of DNA as the genetic material. Bacterial conjugation, transduction, lytic and lysogenic cycle.

Unit-2 12 Hours

DNA replication

DNA replication in prokaryotes- semi conservative replication, enzymology of DNA replication. Discontinuous replication, replication in circular DNA, replication in eukaryotic chromosome. DNA repair- alternation in the DNA molecule and its repair, methylation and mismatch repair, excision, recombination and SOS repair.

Unit-3 12 Hours

Transcription

RNA types and functions, initiation, elongation and termination of RNA synthesis. RNA Polymerases (eukaryotic and prokaryotic), inhibitions of transcription.

Unit-4 12 Hours

Translation

Genetic code- major features. Wobble hypothesis. Translation- activation of aminoacid, initiation, elongation and termination, inhibitors of translation

Unit-5 12 Hours

Regulation of gene expression

Translocation, post translational modifications, glycosylation. Bacterial signal sequences, mitochondria, chloroplast and nuclear protein transport. Gene expression and regulation in prokaryotes. Operon concept- lac, trp, arabinose operons.

References

1. Daenell J. et al in 1986. Mlecular Cellbiolgy, Scientifi American book, USA
2. Lewin. B, 1993, GENES V and VI, Oxford University press, New York.
3. Weaver. R.F and Philip.P.W., 1989, Genetics, WMC Brown Publishing.

Course-10: ENDOCRINE BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To provide the basis for understanding endocrine diseases and their management.

Total hours : 60

Unit-1 12 Hours

Introduction to endocrine system

Hormones- definition, classification, biosynthesis, circulation in blood, modification and degradation.

Mechanism of hormone action, class I and Class II hormone receptors- structural features and regulation. Role of second messengers in hormone action. Feed back regulation of hormones.

Unit-2 12 Hours

Hypothalamus and pituitary hormones

Hypothalamic releasing factors, vasopressin and oxytocin. Biosynthesis, secretion, transport, regulation and biological effects of growth hormone, FSH,LH, TSH, ACTH and prolactin. Hyper and hypo activity of pituitary and hypothalamus- acromegaly, dwarfism diabetes insipidus and hypopituitarism

Unit-3 12 Hours

Thyroid hormones

Biosynthesis, secretion, transport, regulation and biological effects of thyroid hormones. Hypo and hyperthyroidism. Anti thyroid agents.

Role of parathyroid hormones, calcitonin and calcitriol in maintaining calcium and phosphorus homeostasis. Hypo and hyper para thyroidism.

Unit-4 12 Hours

Hormones of pancreas

Hormones of the pancreas, islets of Langerhans- cell types, biosynthesis, mechanism of action and biological effects of insulin and glucagon. Gastro intestional hormones.

Unit-5 12 Hours

Adrenal hormones

Biosynthesis, secretion, transport, biological effects, mechanism of action and excretion of adrenal cortical and medullary hormones. Pathophysiology of adrenal gland secretions.

Biological effects of androgens and estrogens, ovarian cycle.

References

1. William textbook of endocrinology- Wilson and Foster 8th edition
2. Harper's biochemistry- Murray et al, 25th edition.
3. Principles f Biochemistry- Mammalian Biochemistry- Smith-et at.
4. Mechanism f Hormone action- Austin and Short.

Course-11 – IMMUNOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To learn about the structural features of the components of the immune system as well as their functions.

Total Hours : 60

Unit-1 12 Hours

Infection

Types, factors influencing infection- pathogenicity. Sources and carriers of infectious agents, Immune system- definition and properties, cells of immune system, Lymphoid organs- structure and function. Types of immunity- Innate and Acquired immunity.

Unit-2 12 Hours

Antigens

Definition, properties, antigenicity, immunogenic determinants and haptens. Types of antigens, Immunoglobulins- basic structure classes and distribution of antibodies.

Unit-3 12 Hours

Antigen antibody interactions

Molecular mechanism of binding, affinity, avidity, valency, cross reactivity and multivalent binding, complement system. Complement components, classical and alternative pathway. Antigen recognition – T & B cell activation. Immunological memory. Lymphokines and cytokines.

Unit-4 12 Hours

Transplantation immunology

Tissue types, graft rejection and role MHC and T cells. Prevention of graft rejection, Hypersensitivity- immediate and delayed types, mechanisms of reaction. Immunisation practice- Active and Passive immunization.

Tumor immunology- tumor antigens, immunosurveilance and NK cells. Primary and secondary immune deficiency disorders.

Unit-5 12 Hours

Immunological techniques

Productin of monoclonal and polyclonal antibodies. Principles and applications of RIA, ELISA, complement fixation tests, precipitation, Immunodiffusion, immunoelectrophoresis, agglutination test- heamagglutination, latex agglutination (Widal, NDRL).

References

1. Immunology- 5th edition Ivan Roitt, Jonathan Brostoff and David male
2. Immunology- 3rd and 4th edition, Janis Kuby
3. Immunology- D.N. Weir
4. Immunology- A short course Eli Benjamine and Sidnet Leshkowi
5. Immunology- Stewart

ELECTIVE – III (Select any ne from the three)

BIOTECHNOLOGY

L	T	P	C
4	0	0	4

Objective: To develop understanding of industrialprocesses for the production of antibiotics, enymes etc.

Total Hours : 60

Unit-1 12 Hours

Tissue culture

Plant tissue culture- Micro propagation and Somoclonal variation, Protoplast culture. Animal cell & Tissue culture- Primary culture, cell lines, In vitro fertilization & embryo transfer in humans.

Unit-2 12 Hours

rDNA technology

General principles, Salient features of cloning vectors, restriction enzymes. Types of cloning vector, plasmids, cosmids, M-13 phage, Macro & microinjection, particle bombardment, electroporation (Vector less mode).

Unit-3 12 Hours

Plant Biotechnology

Vectors for gene transfer (Ti, Ri Plasmids, Co integrate, intermediate & helperplasmids), binary vectors, viruses as vectors: gene transfer techniques using Agrobacterium, Selectable marker, reporter genes & promoters. Transgenic plants, crop improvement, resistance to herbicide, insects, pests & viruses.

Unit-4 12 Hours

Animal Biotechnology

Genetic engineering in animals, animal viral vector & yeast vectors. Biotechnlogy of silkworm. Mapping of human genome, genetic engineering approaches for the correction of genetic disorder.

Unit-5 12 hours

Microbial Biotechnology

Bioprocess – Basic principles of microbial growth. Types, design and operation of fermentors, Antifoaming devices & agents. Downstream processing, Oil spill clean up by microbes, Biodegradable plastics, Bioleaching.

References

1. Biotechnology- P. K. Gupta
2. Biotechnology – H. D. Kumar
3. Text book of Biotechnology – Dubey
4. Recombinant DNA Technology – Watson
5. Molecular Biotechnology – Glick & Pasternack

GENOMICS AND PROTEOMICS

L	T	P	C
4	0	0	4

Objective: To introduce contemporary methods for genomic, proteomic and food analysis with emphasis on the application of biological mass spectrometry based methods to a wide range of research.

Total Hour : 60

Unit-1 12 Hours

Genome maps

Types of Genome maps and their uses: High and low resolution maps – Map elements – Polmorphic markers, line sine, RFLP, SNP.

Types f Maps: Cytogenic - Linkage map, Transcript map, Physical map- Comparative map, integrated map

Practical uses of Genomic maps: Locating Genomic regions, target identification, arrangement of genes, SMP diagnosis, Positional specific cloning, Predicting Gene function, identifying regulatory genes.

Unit-2 12 Hours

Structural annotations

Locating coding regions and other structural elements of the gene. Various approaches in gene prediction, gene prediction in prokaryotes and eukaryotes. Hiddem markov model.

Unit-3 12 Hours

Human Genome and Genomic analysis

Size, features, composition and characteristics of human genome- Sequence repeats, transposable elements, gene structure and pseudogenes.

Genome analysis – Gene order (Synteny), Chromosome rearrangement, compositional analysis, clustering of genes and composite genes.

Unit-4 12 Hours

Proteomics

Structural element and terminology – phi and psi bonds, letter code for amino acids, helix, sheet strand, loop and coil.

Active site, Architecture, blocks, class and domains, fold, motif, PSSM, profile.

Protein structure prediction: Use of sequence pattern- Leucine zipper, coiled coil, transmembrane, signal peptide and cleavage site.

Secondary structure prediction: Chou-Fasman/ GOR method, neutral network, nearest neighbor method, tertiary structure prediction, threading, profile, contact potential and modeling.

Unit-5

12 Hours

Proteome – analysis

2D Electrophoresis – Immobilized pH gradient, Sample preparation, first dimension criteria, second dimension criteria, Stabilization.

Data analysis – Mass spectrometry based methods for protein identification and analysis.

References

1. David W. Mount (2001), Bio-informatics sequence and genome analysis, Cold Spring Harbor Laboratory Press.
2. Ed. Andreas D. Baxewanis and Francis Quellette, Bio-informatics, a practical guide to the analysis of genus and proteins, John Willey & sons publications
3. Pennigtons S.R. and Dunn M.J. (2002), Proteomics, Viva books pvt ltd.

DRUG BIOCHEMISTRY

L	T	P	C
4	0	0	4

Objective: To introduce biochemical pharmacology and highlights drug absorption and drug transformation reactions, drug discovery and clinical trials for new drugs.

Total Hours : 60

Unit-1 12 Hours

Introduction and receptor concept

Introduction to drugs, Classification of drugs, Passage of drugs across biological membrane; Absorption and distribution of drugs; Binding of drugs to plasma proteins.

Drug receptor interaction, Binding forces in drug receptor interaction, types of receptors, receptor theories, isolation of receptors, consequences of drug receptor interaction.

Unit-2 12 hours

Drug metabolism and elimination

Drug metabolism, methods of studying drug metabolism- microsomal drug metabolism, metabolism via hydroxylation, conjugation, deamination, N- oxidation, azo & nitro reduction, non-microsomal oxidation, oxidative deamination, purine oxidation, dehalogenation, hydrolysis , action of choline esterase. Elimination of drugs from the body with reference to renal system.

Unit-3 12 Hours

Chemotherapy

Mode of action of sulfonamides, anti-metabolites of folate, purines and pyrimidines. Anti-bacterials- mode of action and resistance to penicillin, streptomycin, tetracycline and chloramphenicaol. Anti viral, anti malarial and anti-TB drugs.

Unit-4 12 Hours

Drugs acting on CNS and Cardio-vascular system.

CNS_structure and mode of action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson's disease.

Unit-5 12 Hours

Immunity to bacteria and viruses.

Skin test; Montex and penicillin test. Resistant to tumors; NK cells; Tumour immune therapy; lymphoid tumours.

Vaccination; passive and active immunization; Recombinant vaccines; DNA vaccines. Benefits and adverse effects of vaccination. CD4 cell count in HIV infection.

References

1. Immunology- An introduction, Tizzard R Jan, 1995.
2. Immunology- Roitt Ivann, Jonanthan Brastoff and David Male. 1993.
3. Text book of microbiology- Ananthanarayanan R and Yayaramman Paniker, 1996.
4. Immunology- Janis Kuby, 3rd edition.
5. Text book of pharmaceutical chemistry – Mohammed Ali CBS Publishers and Distributors, New Delhi, 1995
6. Pharmacology , An introduction to Drugs, Prentice Hall Inc, Eaglewood Cliif, New Jersey,1994.
7. Pharmaceutical chemistry- G.R. Chatual, Vol II, 1st editin, Himalaya Publishing House, Bombay, 1991.

PRACTICAL 8: CLINICAL BIOCHEMISTRY –II

L	T	P	C
0	0	4	2

1. Estimation of urea from urine
2. Estimation of uric acid from urine
3. Estimation of phosphorus from urine
4. Estimation of calcium from urine
5. Estimation of glucose from urine
6. Qualitative analysis of abnormal constituents of urine
7. Determination of the titrable acidity and ammonia in urine
8. Estimation of Chloride from urine
9. Qualitative analysis of pathological urine sample

Reference Books 1. Practical Clinical Biochemistry- Varley's by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition ,1988. 2. Laboratory manual in Biochemistry, T.N.Pattabiraman. All India publishers, 1998. 3. Practical Biochemistry for Students, Varunkumar Malhotra, Jaypee Bros, 1986. 4. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000. 5. Medical Lab Technology Vol I& II, Kanai L Mukerjee New Delhi: Tata Mcgraw Hill Publishing Company, 1996. 6. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000. 7. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd

PRACTICAL 9: Immunology and Molecular Biology Techniques

L	T	P	C
0	0	4	2

1. Immunodiffusion-Ouchterlony
2. Immunoelectrophoresis
3. dot ELISA
4. Separation of plant pigments by column chromatography
5. Separation of lipids by Thin Layer Chromatography
6. Separation of aminoacids by paper chromatography
7. Separation of proteins by SDS-PAGE
8. Western Blotting of protein
9. Separation of DNA by Agarose gel electrophoresis
10. WIDAL test
11. VDRL test

Reference Books:

1. Practical Clinical Biochemistry- Varley's by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition ,1988. 2. Laboratory manual in Biochemistry, T.N.Pattabiraman. All India publishers, 1998. 3. Practical Biochemistry for Students, Varunkumar Malhotra, Jaypee Bros, 1986. 4. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000. 5. Medical Lab Technology Vol I& II, Kanai L Mukerjee New Delhi: Tata Mcgraw Hill Publishing Company, 1996. 6. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000. 7. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd

PRACTICAL 10: MICROBIAL TECHNIQUES

L	T	P	C
0	0	4	2

1. Gram staining
2. Negative staining
3. Acid fast staining
4. Determination of growth curve
5. Simple staining
6. Enumeration of microorganisms from soil
7. Enumeration of microorganisms from air
8. Enumeration of microorganisms from water
9. Microbial growth curve
10. Determination of microbial motility.
11. Biochemical Characterization of Bacteria 1. Indole test 2. Methyl Red test 3. Triple Sugar Iron Agar test 4. Voges Proskauer test 5. Citrate Utilization test 6. Catalase test 7. Urease test 8. Oxidase test 9. Nitrate test

Reference Books: 1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000. 2. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000 3. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000. 4. Laboratory manual in Biochemistry T.N.Pattabiraman. All India publishers, 1998. 5. Lab Manual in General Microbiology - N Kannan, Palaniappa Brothers, 2000. 6. Lab Manual in Microbiology - Dr P Gunasekaran, New Age International Pub, 2000.