

PERIYAR UNIVERSITY, SALEM -11

M.Sc - BIOCHEMISTRY

OBJECTIVES OF THE COURSE

The two year M.Sc programme of in Periyar University is designed to help all the students to get good quality education in the field of Biochemistry so that they can find employment after their Post graduation .The ultimate aim is to enable the students to develop an integrated approach for understanding the various life science problem at the molecular level .In addition ,the present curriculum gives scope for vertical and horizontal mobility in the education system so that the students can enter different modules to update their knowledge depending upon the employment opportunity in each area .Various practical courses have been designed not only to enable the students to appreciate scientific basis of various life process but also to train them for self – employment .The practical training will develop their reasoning ability to critically evaluate the results obtained from the projects.

There is a demand globally for trained manpower in the area of Biochemistry for Research and Development in Multinational Companies, Public Sectors, Quality Control Laboratories Biopharmaceutical Companies, and Diagnostic Centers and Food industries as well as in Universities and the present curriculum will cater to that needs

ELIGIBILITY FOR ADMISSION

A Bachelors degree in science with Biochemistry, Microbiology, Biotechnology, Chemistry, Botany, Zoology, Nutrition, B.Sc Agriculture and Life sciences as main subject of this university or any other university or any other qualification accepted as equivalent thereto are eligible for admission to M.Sc degree course

DURATION OF THE COURSE

The course duration shall be two years consisting of four semesters. Each academic year shall comprise the first and the second semesters and the second academic year the third and fourth semesters respectively.

DISSERTATION

Aim: Application of knowledge to real life situation and to introduce research methodology Topic of dissertation may be choosen from any area of Biochemistry and may be laboratory based ,field based or both or computational,with emphasis on originality of approach .It may be started after the completion of second semester and shall be completed at the end of fourth semester .The dissertation to be submitted should include

i) Background information in the form of introduction. ii) Objectives of the study iii) Material and Method employed for the study iv) result and discussion v) Summary and Conclusion vi) Reference. Apart from these sections, importance of the result, originality and general presentation also may be taken into consideration for evaluation.

ELIGIBILITY FOR THE AWARD OF DEGREE

A Candidate shall be eligible for the award of degree only if he/she has undergone the prescribed course of study ,for a period of not less than two academic years and passed the examination prescribed and fulfilled such conditions as have prescribed therefore.

PASSING REQUIREMENT

A Candidate shall be declared to have passed in each paper/practical wherever prescribed if he/she secures not less than 50 percent of the marks prescribed for the examination .He/she shall be declared to have passed the whole examination if he/she passed in all papers and practical as per the scheme of examination and qualification of the degree.

CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidate who secures not less than 60 % of the aggregate marks in the whole of the examination shall be declared to have passed the examination in the FIRST class. All other successful candidates shall be declared to have passed the examination in the SECOND class. Candidates who obtain 75% and above in the aggregate shall be deemed to have passed with DISTINCTION provided they pass the examinations in the first appearance .Candidates who pass all the examinations prescribed for the course in the first appearance and within a period of two academic years from the year of admission to the course are only eligible for ranking

EXTRA DISCIPLINARY COURSE

The college or the department is responsible for selection of the extra disciplinary course for the students. They can select the papers given by the Board of Biochemistry or any other discipline.

INTENSHP

Candidate must undergo an internship training programme for a period of 15 days in a reputed clinical lab for Lab course -5 for which one credit 25 marks will be awarded along with that lab course. On completion of internship only the lab course marks can be awarded for the completion of the course.

COURSE OF STUDY

SEMESTER I

PART	COURSE CODE	COURSE	HOURS	CREDIT	MARKS		
					CIA	EA	TOTAL
CORE I		BIOMOLECULES	5	5	25	75	100
COREII		CELL AND MOLECULAR BIOLOGY	5	5	25	75	100
CORE III		ADVANCED ENZYMOLOGY	5	5	25	75	100
ELECTIVE		BIOPHYSICAL CHEMISTRY AND BIOCHEMICAL TECHNIQUES	5	4	25	75	100
PRACTICAL		LAB COURSE-I	5	4	40	60	100
PRACTICAL		LAB COPURSE-II	5	4	40	60	100

TOTAL CREDITS - 27

TOTAL MARKS - 600

SEMESTER II

PART	COURSE CODE	COURSE	HOURS	CREDIT	MARKS		
					CIA	EA	TOTAL
CORE IV		INTERMEDIARY METABOLISM	5	5	25	75	100
COREV		GENETIC ENGINEERING AND FERMENTATION TECHNOLOGY	5	5	25	75	100
CORE VI		PLANT BIOCHEMISTRY	5	5	25	75	100
ELECTIVE		BIOSTATISTIC AND RESEARCH METHODOLOGY	5	4	25	75	100
VALUE EDU		HUMAN RIGHTS	2	2	25	75	100
PRACTICAL		LAB COURSE-III	5	3	20	30	50
PRACTICAL		LAB COPURSE-IV	5	3	20	30	50

TOTAL CREDITS - 27

TOTAL MARKS - 600

SEMESTER III

PART	COURSE CODE	COURSE	HOURS	CREDIT	MARKS		
					CIA	EA	TOTAL
CORE VII		ADVANCED CLINICAL BIOCHEMISTRY	5	5	25	75	100
CORE VIII		ADVANCED ENDOCRINOLOGY & NEUROPHYSIOLOGY	5	5	25	75	100
CORE IX		CONCEPTS OF IMMUNOLOGY	5	5	25	75	100
ELECTIVE		BIOINFORMATICS & NANOTECHNOLOGY	5	4	25	75	100
PRACTICAL		LAB COURSE-V AND INTERNSHIP (for 15 Days)	4	3	40	60	50
PRACTICAL		LAB COURSE-VI	4	3	40	60	50

TOTAL CREDITS - 25**TOTAL MARKS - 600****SEMESTER IV**

PART	COURSE CODE	COURSE	HOURS	CREDIT	MARKS		
					CIA	EA	TOTAL
ELECTIVE		DRUG BIOCHEMISTRY AND TOXICOLOGY	5	4	25	75	100
ED PAPER		PAPER CAN BE SELECTED BY THE COLLEGE OR BY DEPARTMENT	5	4	25	75	100
PROJECT		PROJECT	-	5	40	60	100

TOTAL CREDITS - 13**TOTAL MARKS - 300****TOTAL MARKS FOR M.Sc BIOCHEMISTRY -2100****TOTAL CREDITS FOR M.Sc BIOCHEMISTRY -92**

SCHEME OF EXAMINATION

S.No	CODE	TITLE OF THE SUBJECT	DURATION OF EXAM	CREDIT	MARKS
1		BIOMOLECULES	3	5	100
2		CELL AND MOLECULAR BIOLOGY	3	5	100
3		ADVANCED ENZYMOLOGY	3	5	100
4		BIOPHYSICAL CHEMISTRY AND BIOCHEMICAL TECHNIQUES	3	4	100
5		LAB COURSE-I	6	4	100
6		LAB COURSE-II	6	4	100
7		INTERMEDIARY METABOLISM	3	5	100
8		GENETIC ENGINEERING AND FERMENTATION TECHNOLOGY	3	5	100
9		PLANT BIOCHEMISTRY	3	5	100
10		BIOSTATISTIC AND RESEARCH METHODOLOGY	3	4	100
11		HUMAN RIGHTS	3	2	100
12		LAB COURSE-III	6	3	50
13		LAB COURSE-IV	6	3	50
14		ADVANCED CLINICAL BIOCHEMISTRY	3	5	100
15		ADVANCED ENDOCRINOLOGY & NEUROPHYSIOLOGY	3	5	100
16		CONCEPTS OF IMMUNOLOGY	3	5	100
17		BIOINFORMATICS & NANOTECHNOLOGY	3	4	100
18		LAB COURSE-V	6	3	100
19		LAB COURSE-VI	6	3	100
20		DRUG BIOCHEMISTRY AND TOXICOLOGY	3	4	100
21		PAPER CAN BE SELECTED BY THE COLLEGE AND THE DEPARTMENT	3	4	100
22		PROJECT	-	5	100

MARK DISTRIBUTION PATTERN

THEORY

EXTERNAL ASSESSMENT -----75 Marks

INTERNAL ASSESSMENT -----25 Marks

QUESTION PAPER PATTERN

Maximum Marks --75 marks

Section A 5x5 =25

Answer ALL Question

(Internal choice)

Section B 5x10 =50

Answer ALL Question

(Internal choice)

Classification of Internal Marks

Seminar -5 Marks

Test -10 Marks

Assignment -5 Marks

Attendance -5 Marks

25 marks

Passing minimum (IA) – 12 marks

Passing minimum (EA) – 38 marks

Total Passing minimum - 50 marks

PRACTICALS

EXTERNAL ASSESSMENT -----60 Marks

INTERNAL ASSESSMENT -----40 Marks

Passing minimum (IA) – 20 marks

Passing minimum (EA) – 30 marks

Total Passing minimum - 50 marks

No Classification for internal assessment.

QUESTION PAPER PATTERN (THEORY)

Duration of Examination: Three hours

Maximum: 75 marks

Section -A (5 x 5 = 25)

Answer ALL the questions

Two question from each unit with internal choice

Section B (5 x10=50)

Answer ALL the questions

Two question from each unit with internal choice

Note to question paper setters

All units in the syllabus should be given equal weightage; key and scheme of valuation should be provided.

QUESTION PAPER PATTERN FOR PRACTICALS

QUESTION PAPER PATTERN -I

TIME : 6HOURS

MAXIMUM MARKS : 60

EXPERIMENT –I : 25 Marks

EXPERIMENT II : 20 Marks

RECORD : 10Marks

VIVA : 5 Marks

QUESTION PAPER PATTERN -II

TIME : 5HOURS

MAXIMUM MARKS : 30

EXPERIMENT –I : 15 Marks

RECORD : 10Marks

VIVA : 5 Marks

BIOMOLECULES

UNIT I - INTRODUCTION TO BIOMOLECULES: Molecular design of life prelude.

Biochemical unity , biological diversity, Biochemical evolution, exploring evolution .

CARBOHYDRATES-classification, structure, function , physical and chemical properties of monosaccharides, oligosaccharides and polysaccharides(homopolysaccharides and heteropolysaccharides).Structure and functions of Bacterial cell wall polysaccharides, glycoproteins, and polyols.

UNIT II - PROTEINS AND AMINOACIDS: Classification, structure (including super secondary structures), function, physical and chemical properties of amino acids and proteins. Amino acid sequencing, Ramachandran plot, Structure and functions of Hb, actin, myosin keratin, collagen, and elastin. Aminoacid sequencing, Ramachandran plot.

UNIT III - LIPIDS: Classification, structure, function, physical and chemical properties of lipids. Lipids and cell membrane, Membrane models, Diversity of biological membranes, membrane dynamics, and membranes of cell organelles .Membrane transport. Channels and pumps

UNIT IV - NUCLEIC ACIDS: Structure of nitrogenous bases, nucleotide, nucleosides, properties of nucleic acids, Cot curve value, types and structure of DNA and RNA (mRNA, tRNA,

rRNA, sn RNA, hnRNA) DNA model, DNA.Histone proteins, chromatin and non histone proteins. Miscellaneous alternative confirmation of DNA- slipped mispaired DNA, parallel stranded DNA and anisomorphic

UNIT V - VITAMINS AND MINERALS: Classification, structure and function of fat soluble and water soluble vitamins (including antioxidant properties).Minerals of biological system (Fe, Ca, Na, K, I, Mg, Mn, Zn, P)

REFERENCE BOOKS:

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

CELL AND MOLECULAR BIOLOGY

UNIT I - INTRODUCTION TO CELL BIOLOGY: Prebiotic molecular evolution and origin of life, review of variety of ecology of living world, evolution of life, types of cell, plant and animal cells, cell organelles- structure and functions, cytoskeleton, types of tissues.

UNIT II - CELL-CELL INTERACTION: cell matrix adhesion, ECM, hyaluronans, proteoglycans, laminin, integrins, fibronectins. Cell-cell adhesion, specialized junctions, desmosomes, gap junctions, tight junctions, adhesion molecules-cadherins and connexins

CELL CYCLE AND CELL DIVISION- Over view of cell cycle and its control in mammalian cells, check points in cell cycle. Apoptosis- pathways regulators and effectors in apoptosis.

UNIT III - GENETIC CODE: Salient features of genetic code, wobble hypothesis, decipheration of genetic code. Contribution of Nirenberg, Matthaei and Khorana. Natural variation in the genetic code .

DNA Replication – Messelson and Stahl's semi conservative replication model, Enzymes of replication (Polymerases, Topo isomerases, Ligases, Helicases, Primases and SSB Proteins.) DNA Replication in prokaryotes and eukaryotes, Rolling circle model, replication of mitochondrial DNA

UNIT-IV - TRANSCRIPTION : (In prokaryotes and eukaryotes) Structure and function of RNA polymerases. Initiation, elongation and termination of transcription, post transcriptional modification, Inhibition of transcription, Ribozymes, RNA Replicase and reverse transcriptase.

TRANSLATION: (In prokaryotes and eukaryotes) t-RNA and its adaptor function, activation of amino acids. Aminoacyl t-RNA synthetase, Ribosomes and its composition. Formation of initiation complex, elongation, termination. Post translational modification.

UNIT-V - REGULATION OF GENE EXPRESSION: Basic elements in control of gene expression, Structural and regulatory genes, mechanism of activation of gene expression, Operon model (Lactose, Arabinose and Tryptophan), Attenuation, Transcriptional control in Eukaryotes in Zinc finger motif, Leucine Zipper, Steroid receptor.

RECOMBINATION AND MUTATION: Recombination-Holliday model, Rec BCD Enzyme, Rec A Protein, Messelson radding model, site specific recombination. Genetic Basis and onset of Cancer. Mutation – DNA Damage and repair.

REFERENCE BOOKS

- Molecular cell biology 3rd (1995) by Lodish H Baltimore & others, Scientific American book.
- Molecular biology of cells by Alberts .
- Cell biology by E S Saedava
- Cell and molecular biology by E D P de Robertis and E M F de Robertes.
- Principles of cell biology by Klein Smith and M Kish
- Molecular cloning, a laboratory manual, J. Sambrook, E. F. Fritsch
- Molecular Cloning: a Laboratory Manual, J. Sambrook, E. F. Fritsch and T. Maniatis, Cold Spring Harbor Laboratory Press, New York, 2000.
- Genes VII Benjamin Lewin (2000) Oxford Univ, Press London.
- Cell and Molecular Biology, 3rd ed., Gerald Karp (2002) John Wiley & Sons Inc.
- Molecular Biology by David Freifelder (1995) Narosa Publishing house. New Delhi.
- Molecular Cell Biology 3rd (1995) by Lodish H. Baltimore and others Scientific American Book.
- Molecular Biology (1999) Weaver R. F. WCB Mc Graw- Hill companies, Inc, New York.
- Brown T A (1995) Essential Molecular Biology, Vol. I, A practical approach, IRL press, Oxford.
- Cell and Molecular Biology, by Ajoy Paul

ADVANCED ENZYMOLOGY

UNIT-I

IUB Classification and Nomenclature , Intracellular Location of Enzymes, Enzyme Units, Active site , Determination of 3D structure of active site, Enzyme Turn over, Significance of Enzyme Turn over. Iso Enzymes , Apo Enzymes , Abzymes, Ribozymes. Monomeric and oligomeric Enzymes.

UNIT-II

Enzyme Kinetics- Steady state theory , MM Equation, LB Plot, Eadie Hostsee Plot , Hanes Plot, Enzyme catalysis and Mechanism of Enzyme catalysis, Serine proteases (Carboxypeptidases, Chymotrypsin) and Lysozyme. Mechanism of Bi Substrate reaction .Metalloenzymes and Metal Activated Enzymes. Co enzymes – Structure and functions.

UNIT-III

Enzyme Regulation: Mechanism, Feed forward stimulation, Feedback inhibition- Allosteric Enzymes, Sigmoidal Kinetics and their Significance, Hill's Equation, Scachard Plot and their application. Reversible and irreversible inhibition- types, Kinetics, Determination of Inhibitor constant and LB Plot.

UNIT-IV

Multi Enzyme complex-Structure and Mechanism of action and Regulation of Pyruvate dehydrogenase

Enzyme Immobilisation- Methods and applications. Role of Enzymes in Colorimetric , Amperometric , Optical and piezo-electric biosensors.

UNIT-V

Application of Enzymes- Enzymes as analytical reagents, Enzymes in Medicine and Industry, Biotechnological applications of Enzymes

REFERENCE BOOKS

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

BIOPHYSICAL CHEMISTRY AND BIOCHEMICAL TECHNIQUES

UNIT-I

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

Microscope and its Types. - Principle, Instrumentation and application of Microscope

Sedimentation -Principle, Instrumentation and application of centrifuges. Types of Centrifugation, Types of Rotors.

UNIT-II

Chromatography- Fundamental concepts, Types, Principle, Instrumentation and application of Chromatography- Paper. TLC, Ion- Exchange, Molecular sieving, Affinity, Adsorption, GLC, HPLC and FPLC.

UNIT-III

Electrophoresis- Separation Methods and fundamental Concepts. Types , Principle, Instrumentation, Application of Paper, Gel, SDS, Native Gel , Isoelectric Focussing,.Pulse Field Electrophoresis, Capillary Electrophoresis.

UNIT-IV

Spectroscopy- Basic Principle , Instrumentation and Application of UV,Visible & IR Spectrophotometers, Mass Spectrophotometry, NMR, ESR, Flame photometry & Fluorimetry.

UNIT – V

Radioisotopes-GM Counter, Scintillation Counter. Quantitation & Detection of Radioactive isotopes (Gas ionization, Liquid scintillation & Autoradiography).Diagnostic & therapeutic uses of radioactive isotopes. Radiation Hazards & Safety measures. Biosensors- Principle, Types and applications.

Applications of techniques- DNA isolation, RNA isolation and protein isolation.

REFERENCE BOOKS

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

LAB COURSE –I PRACTICAL - 1

1. Isolation and Estimation of Glycogen by Colorimetric method.
2. Estimation of Thiamine and Riboflavin by Fluorimetry method.
3. Separation of Lecithin from Egg yolk by TLC.
4. Estimation of Sodium and Potassium by Flame Photometry.
5. Differential centrifugation of cell organelles and identification of Marker Enzymes.
6. Mitotic Preparation –Onion Root tip.
7. Estimation of Calcium from Milk by Titrimetry.
8. Separate the given Amino acids and Sugars by Paper Chromatography (Ascending, Descending and circular).
9. Separation of Serum LDH by SDS PAGE.

LAB COURSE –II

I. Enzyme Isolation and Assay of Enzymatic Activity.

- a. Extraction and Purification of Enzymes(Peroxidase)
- b. Molecular Weight Determination of Enzymes(Peroxidase) by Molecular Sieve
- c. Specific Activity (Peroxidase)

II. Immobilisation Enzyme

- a. Immobilisation of peroxidase/Acid phosphatase by matrix entrapment, ionic and cross linking

III. Enzyme Kinetics

- a. Assay of peroxidase and Effect of pH and temperature on enzyme activity.
- b. Assay of salivary Amylase, AST, ALT, ALP, ACP.

REFERENCE BOOKS:

LAB COURSE –I & LAB COURSE -II

- Practical Clinical Biochemistry, Volume I and II – Harold Varley, et al., CBS Publishers , Fifth Edition, 1980.
- Biochemical Methods. Sadasivam .S and Manickam, A. II Edition. New Age International Private Ltd. Publishers.
- Laboratory techniques in Biochemistry and Molecular Biology , Work and Work.
- A Biologist's Guide to principles and Techniques of Practical Biochemistry, K.Wilson and K.H.Goulding, ELBS Edition, 1986.
- Modern Experimental Biochemistry Boyer, R, III Edition , Benjamin Cummings Publishers.
- A Text Book of Practical Biochemistry, by David Plummer.
- Enzyme Structure and Mechanism, A. N. Fersht (1997).

INTERMEDIARY METABOLISM

UNIT I

Introduction to metabolism of cells, Aerobic glycolysis & Fermentation-energetics of glycolysis & fermentation. Gluconeogenesis, substrate cycle & reciprocal regulation of glycolysis & gluconeogenesis. Metabolism of glycogen & regulation. Maintenance of blood sugar by liver. Citric acid cycle & its regulation-energetics. The amphibolic nature of the citric acid cycle, HMP shunt, Uronic acid pathway, Cori's cycle, The Glyoxalate pathway, Metabolism of fructose, Galactose & Mannose. Lactose synthesis & Glycoprotein synthesis. Synthesis of bacterial cell wall polysaccharides.

UNIT II

Oxidation saturated & unsaturated fatty acids. Oxidation of fatty acids with even & odd numbered carbon atoms. Alpha, Beta & Omega oxidation. Ketogenesis, biosynthesis of saturated & unsaturated fatty acids. Regulation of fatty acid metabolism. Mitochondrial chain elongation. Metabolism of triacyl glycerol, phospholipids & sphingolipids.

Cholesterol biosynthesis & regulation. Degradation of cholesterol, cholesterol transport excretion, lipoprotein metabolism. The cyclic & linear pathways of arachidonic acids metabolism. Prostaglandins and thromboxanes metabolism.

UNIT III

High energy phosphates. Components of electron transport chain and the sequence of electron transport. Oxidative phosphorylation – the chemiosmotic theory. Mechanism of ATP synthesis. Uncoupling of oxidative phosphorylation. Inhibitors of respiratory chain and oxidative phosphorylation. Mitochondrial transport systems, ATP/ADP exchange, malate/glycerol phosphate shuttle

UNIT IV

Degradation of amino acids – transamination, oxidative and non-oxidative deamination, decarboxylation- urea cycle and its regulation. Catabolism of amino acids-carbon skeleton of amino acids to amphibolic intermediates, key role of glutamate dehydrogenase in nitrogen metabolism.

Integration of metabolism

Interrelationship of carbohydrates proteins and fat metabolism- role of acetyl CoA and TCA cycle. Interconversion of major food stuffs. Metabolic profile of the principal organs and their relationships.

Biosynthesis of non-essential amino acids. Conversion of amino acids to specialized products. Serotonin, Gamma amino butyric acid, dopamine, epinephrine, nor- epinephrine, melanin, creatinine, creatine.

UNIT V

Metabolism of nucleotides, de novo synthesis purine nucleotides, salvages pathway degradation of purine nucleotides, de novo synthesis pyrimidine nucleotides, salvages pathway, degradation of pyrimidine nucleotides , inhibitors, metabolism of porphyrin . Biosynthesis and degradation of porphyrin, heme, formation,transport and excretion of bile pigment .

REFERENCE BOOKS

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

GENETIC ENGINEERING AND FERMENTATION TECHNOLOGY

UNIT-I

Introduction to Gene Manipulation – Basic techniques of Genetic Engineering –Isolation and purification of Nucleic acids, Agarose gel electrophoresis, Southern Northern, Western Blotting, PCR and its types, RFLP,RAPD . Genetic transformation of prokaryotes: Transferring DNA into E.coli – Chemical induction and Electroporation. DNA delivery methods, Gene targeting and Gene tagging.

Restriction modification enzymes used in recombinant DNA technology. Cloning vectors - Plasmid cloning vector PBR322, other plasmid vectors. Cloning of foreign genes: Vectors for cloning large piece of DNA. Bacteriophage vectors and other phage vectors,Cosmids, Phagemids; YAC and BAC vectors. Viral vectors –SV40, Reterovirus,Adenovirus, Vacciniavirus and Baculovirus as Vectors. Marker genes - Selectable markers and Screenable markers, non-antibiotic markers.

UNIT-II

Gene expression in prokaryotes- Tissue specific promoter, wound inducible promoters, Strong and regulatable promoters; increasing protein production; Fusion proteins; Translation expression vectors. Mammalian cell expression vectors, Two-vector expression system, two-gene expression vector. Gene library- Construction cDNA library and genomic library, screening of gene libraries – screening by DNA hybridization, immunological assay and protein activity.

UNIT-III

Gene Therapy- Somatic cell Gene therapy, Germ cell gene therapy, Stem cell and its application in gene therapy. Gene therapy for inherited disease, cystic fibrosis, ADA, infectious disease, familial hypercholesterolemia, Antisense oligonucleotides, Si RNA, Micro RNA , Ribozymes ,Artificially designed Aptamers ,

UNIT-IV

Fermentor/bioreactor- types and design of fermentor , Inoculum preparation ,cell growth, substrate utilization, product formation .Mode of fermentation- fed-batch, batch and continuous culture; process and its control. Downstream processing –Recovery and purification of products

UNIT-V

Food fermentations- Bread, Malt Beverages, Vinegar, Fermented Vegetables, Fermented Dairy products, Microorganisms as Food- Single cells protein, Fats from Microorganisms, Production of Amino acids, Production of Enzymes. Production of bioinsecticides and fungal polysaccharides.

GM foods, Food security and General ethical concern-Foods produced using modern biotechnology, Impacts of GM foods on human health and environment.

REFERENCE BOOKS

- Molecular Biotechnology. Glick, B.R. and Pasternak, J.J. 2003. ASM Press, USA.
- DNA Molecular Biotechnology. Glick, B.R. and Pasternak, J.J. 2003.
- cloning 1 and 2. Glover, D.M. and Hames, B.D. 1995. IRL Press
- Molecular Cloning, A laboratory Manual. Sambrook, J., Fritsch, E.F., Mariatis. 3rd edition. 2001. Cold Spring Harbor Laboratory, USA.
- Recombinant DNA. Watson, 1992.
- Molecular Biology of the Cell (4th edition). Alberts, Johnson, Lewis, Raff, Roberts and Walter.
- Molecular Cell Biology (5th edition). Lodish, Berk, Matsudaira, Kaiser, Krieger, Scott, Zipersky and Darnell.
- Molecular Biology of the Gene. Watson, Baker, Bell.
- Watson, J.D., Tooze, J. and Kurtz, D.T. 1983. Recombinant DNA: A Short Course Scientific American Books, New York
- Drlica, K. 1984., understanding DNA and Gene Cloning: A Guide for the

Curious, John Wiley & Sons, New York.

- Steven, P., 1984., Biotechnology – A New Industrial Revolution, George Braziller
- Antebi, E. and Fishlock, D. 1986. Biotechnology, The MIT Press, USA.
- Marx, J.L., 1989. A Revolution in Biotechnology, Cambridge Univ. Press, UK.
- Old, Principles of Gene Manipulation and Introduction to Genetic Engineering, 3
- Koshland, Biotechnology.
- Biotechnology. Smith, 1996,
- Biotechnology. Rehm, 1986.
- Introduction to Biotechnology. Brown, 1987.
- Genetic Engineering. Kingsman and Kingsman, 1988,
- Biotechnology by U. Sathyanarayana
- Industrial Biotechnology by A.H.Patel.

PLANT BIOCHEMISTRY

UNIT I

Photosynthesis and transpiration:

Photosynthetic apparatus, Pigments, Biochemistry of Dark and light reaction, inhibitors and regulation and factors affecting photosynthesis. Bacterial photosynthesis ATP synthase- bacterial chloroplast and mitochondria.

Water absorption and transpiration: Mechanism of water absorption, symplast and apoplast concept, transpiration – types, theories of transpiration, mechanism and factors affecting transpiration.

UNIT II

Biogeochemical Cycles ,Outlines of gaseous and sedimentary cycles ,role of macro and micronutrients in plants and hydroponics ,Nitrogen fixation and its types .Biochemistry of symbiotic and as symbiotic nitrogen fixation .Physiology of nodule formation ,genetics and genetic manipulation for nitrogen fixating genes .Nitrogen assimilation ,Interrelationship between Photosynthesis and nitrogen metabolism.

UNIT III

Biosynthesis ,transport ,distribution ,mechanism of action and physiological effects of Auxin ,Gibberellins ,cytokinins abscisic acid ethylene .Phytochrome ,Biological clock ,Physiology and biochemistry of seed germination and dormancy. Types of dormancy and methods to overcome dormancy. Senescence.

UNIT IV

Biosynthesis and function of flavonoids,alkaloids ,terpenoids ,anthocyanins,steroids and lignin. Defense mechanism: structural and biochemical defense mechanism in plant .Principle of plant disease. Control of plant disease.

UNIT V

Gene Transfer techniques in plants – Direct, Vector mediated transfer. Ti Plasmid and Ri plasmid. Transgenic plants – Plant resistance to biotic and abiotic factors .Transgenic plants for improved nutrition, crop yield and as bioreactors.

Tissue culture and its types and application

REFERENCE BOOKS

- Plant Biochemistry by Dey and J.B. Harborne
- Plant biochemistry and Molecular biology by Peter J .Lea, Richard .C. Leegood
- Biochemistry and Molecular Biology of Plants – Buchanan,Grussem Jones
- Plant Biochemistry – Hans Walter Heldt
- Methods in Plant biochemistry and Molecular biology by William .V.Dashek
- Introduction to plant Biochemistry by T.W.Goodwin and E.I .Mercer.
- Plant Pathology – B.P Pandey

BIostatistic and Research Methodology

UNIT I

Biostatistics –meaning, basic principles, importance in biological practice, variables –scales measurements, collection of data –questionnaire, classification –tabulation, diagrammatic and graphical representation of the biological data.

UNIT II

Sample, population –sampling methods, survey statistical inference, point of interval estimation, hypothesis --simple hypothesis testing normal, t-test, chi-square test, ANOVA and interpretation, important non parametric methods.

UNIT III

Measures of central tendency ,variation ,standard deviation –standard error of mean, correlation, regression ,; Simple linear regression , multiple linear regression ,logistic regression . Introduction to multivariate analysis .Statistical packages (SPSS, STATA etc).Prediction and its importance, probability, sensitivity, specificity, efficiency of screening test, normal distribution-properties and its importance.

UNIT IV

Research methodology :Biological research meaning – importance ,constraints – steps in research process –selection and statement of problem ,formulation of hypothesis ,review of literature ,pilot study , reliability and validity of a tool .IPR – Bioethics

UNIT V

Principles and method of research designs –experimental and non –experimental design-sectional, prospective and retrospective studies. Time scheduling – lab and field facilities – Research duration –choice of research topic –methodology procedure, Preparing, writing and documentation of research report .Role of computers in biological research and practice.

REFERENCE BOOKS

- Biostatistics analysis, Zar, J.H 1984, Prentice Hall, New Jersey.
- Statistical methods for Biologists ,Palanichamy.S and Manoharan .M 1990
- Statistical methods S.P Gupta
- Biostatistics –A foundation for analysis in health science ,Daniel.
- Research Methodology –Methods and Techniques- C.R.Kothari
- Research methods in Biological Science –Dr.S.Palanichamy, M.Shanmugavelu
- Biochemical Calculation and Biostatistics – Dr E.Padmini

LAB COURSE –III

1. Callus Induction and micro propagation
2. Isolation of protoplasts
3. Protoplast Culture
4. Anther culture
5. Somatic Embryogenesis
6. Collection of medicinal plants and qualitative analysis of secondary metabolites such as
 - a) Phenols b)Flavonoids c) Alkaloids d) Glycosides e) Steroids
7. Estimation of chlorophyll in leaves
8. Determination of aldehydes in lemon oil
9. Extraction and confirmation of
 - a. Pectin from orange peel
 - b. Caffeine from tea
 - c. Solanine from potato

LAB COURSE –IV

1. Isolation of Genomic DNA
2. Isolation of RNA
3. Restriction digestion of DNA
4. Isolation of plasmid DNA
5. Preparation of competent cell -Transformation
6. Agarose Gel electrophoresis

7. Southern Blotting –Demonstration
8. PCR - Demonstration

REFERENCE BOOKS

LAB COURSE -III & LAB COURSE –IV

- Plant Biotechnology –Practical manual – C.C.Giri& Archana Giri
- Introductory Practical Biochemistry –S.K.Sawhney,Randhir Singh
- Biochemical methods by Sadasivam ,A.Manickam
- Practical Pharmacognosy by C.K.KoKate
- Molecular Cloning –a laboratory manual J.Sambroke ,E.F.Fritsch&T.Maniatis
- Recombinant DNA principles and methodologies James .J .Greene ,Venigalla.B.Rao
- DNA Cloning - a practical approach ,D.M.Glover and B.D.Hames

ADVANCED CLINICAL BIOCHEMISTRY

UNIT – 1

Basic principles and practices of clinical laboratory collection of specimens – Blood, Urine, Amniotic fluid – patient management, Prognosis and Diagnosis. Laboratory safety – toxic chemicals and biohazards. Automation in clinical laboratory – Precision, Quality assurance, clinical validation and accreditation.

UNIT – 2

Disorders of carbohydrate metabolism (Hyperglycemia and Hypoglycemia): Diabetes Mellitus, Insulin receptors and C-peptides, Glycogen storage disease, Mucopolysaccharides, Lipids and lipoprotein abnormalities; Lipidosis, hypercholesterolemia, hypercholesterolemia and plasma lipoproteins – albuminuria Taysach's and Niemann picks diseases.

UNIT -3

Disorders of aminoacids metabolism: Inborn errors of Branched chain amino acids, aromatic amino acids, aliphatic amino acids. Disorders of Nucleic acid metabolism: Purine and Pyrimidine metabolism – Gout, Lesch Nyhan syndrome and hereditary Ortoticaciduria.

UNIT – 4

Renal function test: Osmolarity and free water clearance, acute and chronic renal failure, renal hypertension, glomerulonephrities, nephritic syndrome, urinary calculi and dialysis. Liver function test: clinical significance of AST, ALT, ALP and Gamma glutamyl transpeptidase, jaundice. Pancreatic function test, Gastro intestinal function test, Cerebrospinal fluid – Characteristics of blood CSF barrier, composition of CSF. Detection of inborn errors in fetus and heterozygous carriers by enzyme assay in amniotic fluid.

UNIT – 5

Disorders of mineral metabolism: Porphyrins, Hemoglobin- Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemia and anemia, Classification of anemia, blood clotting.

REFERENCE BOOKS

- Fundamentals of clinical chemistry, N.W .Teitz, W.B.Saunders Company ,Second Edition 1994.
- Teitz Fundamentals of clinical chemistry -A.Buritis,E.R.Ashwood(eds.)
Saunders WB CO.
- Practical Clinical Biochemistry ,Volume I and II –Harold Varley et al., CBS Publishers, Fifth Edition,1980
- Text Book of Medical Physiology (10th Edition 2000) by A.C.Guyton & J.E.Hall,Harcourt Asia
- Zubay, G.L.Biochemistry ,W.M.C .Brown publishers, New York 1998.
- Campbell ,P.N and A.D.Smith, Biochemistry Illustrated 4th edition,Churchill Livingstone .
- Clinical chemistry in Diagnosis and treatment ,Philip. D.Mayne, ELBS Publication 6th edition ,1994.
- Clinical Biochemistry –Metabolic and clinical aspects, William J.Marashall and Stephen K Bangert,Pearson professional Ltd.1995.
- Deb .A.C., Fundamentals of Biochemistry, Books and allied (p) Ltd,2002.
- Essentials of Biochemistry Sathyanarayanan.U. Books and allied (p) Ltd,2002
- Biochemistry ,Jeremy M.Berg ,John L.Tymoczko,Lubert Stryre ,5th edition

ADVANCED ENDOCRINOLOGY AND NEUROPHYSIOLOGY

UNIT – 1

Structure and physiology of hypothalamo –hypophyseal complex, Thyroid, Parathyroid, Pancreas, Adrenal, Gastro Intestine and Gonads.

UNIT – II

Definition of Hormones – Chemical nature of mammalian hormones – Classification and mechanism of action of peptide hormones .Concepts of receptors- G –Protein coupled receptors – Adenylate cyclases.Pharmacological receptors- Neurotransmitter receptor .Steroid hormones –

Structure of receptors –Functional Domain –DNA binding sites.Nuclear transport mechanism – Transcriptional and post transcriptional mechanism.

UNIT – III

Synthesis, Secretion, Mechanism of action of hormones of hypothalamus –hypophyseal complex, Thyroid, Parathyroid, Pathophysiology and clinical evaluation of hormones of hypothalamo –hypophyseal complex, Thyroid Parathyroid

UNIT – IV

Synthesis, Secretion, Mechanism of action of hormones of pancreas, Adrenal, Gastro Intestine and Gonads Pathophysiology and clinical evaluation of hormones of Pancreas, Adrenal, Gastro Intestine and Gonads

UNIT – V

Neurohormones –Endorphins,Enkephalins, Brain hormones and behaviour,sensory perception,Conduction of nerve impulse ,Evolution of Hormones ,Biochemical aspects of learning and memory.

REFERENCE BOOKS

- Endocrinology ,Mac E.Hadley ,Publishers –Prentice Hall international Inc,Fourth Edition
- Text book of Medical physiology Guyton
- Principles of Biochemistry ,Emil I.Smith
- Endocrinology – Williams
- Molecular Medical Biochemistry-J.P.Luzio .R.J .Thompson
- Cell Signalling- John T. Hancock.

CONCEPTS OF IMMUNOLOGY

Unit I

Basic concepts of immunology- types of immunity, components of immune system, haematopoiesis. Immune reactive cells- B cells and T cells, mast cell, phagocytic cell, structure and function of primary and secondary lymphoid organs. Antigens, chemical nature, types, epitope, cross reactivity, adjuvant, super antigen, and mechanism of immunity to infection.

Unit II

Antibodies- Structure, theories of antibody formation, classes, immunoglobulin super family, generation of antibody diversity, class switching, primary and secondary immune response, kinetics, antigen recognition, antigen processing and antigen presentation, activation of B cells and T cells, immunological memory, lymphocytes and cytokines.

Biology of the complement system, MHC complex class I, II and III molecules, transplantation immunology- allograft, typing – HLA typing and MLR. GVH reaction, organ transplantation, and immune suppressive therapy.

Unit III

Hyper sensitivity- types 1 to 5, mechanism, assay and treatment. Immunotolerance, autoimmune disorders. Immunization –active and passive immunization, vaccines toxoids, recombinant vaccines.

Hybridoma technology – monoclonal antibodies production and application in biomedical research, catalytic antibodies, plantibody.

Unit IV

Immunology disorders- B cell deficiencies, T cell deficiencies, secondary immuno deficiency diseases – AIDS- HIV lifecycle, pathogenesis, immunological abnormalities, diagnosis and treatment, AIDS vaccine.

Tumor immunology – immune surveillance – tumor viruses – tumor associated transplantation antigens – tumor specific antigens. Cell surface changes – tumor associated oncofoetal antigens, immune response to tumors- approaches to cancer immunotherapy – immuno diagnosis.

Unit V

Isolation and characterization of immune cells. Macrophage culture and assay of macrophage activation. Mitogen and antigen induced lymph- proliferation assay. Purification and quantification of antibody RID, EID, Nephelometry. Antigen-Antibody reactions in vivo and invitro.

REFERENCE BOOKS

- Immunology (4 th edition 1998)by Ivan Roitt,J.Brostoff and David Mole.
- Essential Immunology (9 th editon 1997) by Ivan Roit Blackwell Science Led.
- Immunology (1992) by Janis Kuby W.H Freeman and Co.Ltd USA.
- Basic and clinical immunology 6 th edition by Stites D.P Stobo,J.D Fundan berg
- Immunolgy an introduction (1995) I.R Tizard.
- Clinical and practical immunology by Talwar volume I and II.

BIOINFORMATICS & NANOTECHNOLOGY

UNIT – I

Elementary computer science:

General awareness of computer hardware; CPU and other peripheral devices (Input/Output and auxiliary storage devices) Basic knowledge of computer system software and programming language-Machine language, assembly language and higher level language. General aspects of popular commercial software packages like MS word, MS Excel, EX power point, other scientific application packages.

UNIT – II

Genomics:

Comparative genomics, Evolution of genomes, Genomic identification, Biomedical genome research, human genomic variation, genome resources- NCBI map viewer, ORF finder, locuslink. Analysis tools for sequence data banks. Pair wise alignment, Smith waterman, Multiple alignment-CLUSTAL, PRAS. Sequence databanks- protein, nucleotides.

UNIT – III

Proteomics:

Gel based protein analysis methods- 2 DE, MALDI-MS, Non gel bases protein analysis: HPLC, MS, LC-MS. Protein interaction network. Blast and Fasta type and their algorithms. Protein classification, secondary and tertiary structure prediction, GOR method, chou-Fasman method, HMMs, neural net works, blocks and profile analysis. Phylogenetic analysis, Maximum parsimony, maximum likelihood, UPGMA methods.

UNIT –IV

Metabolomics:

Basics, Data bases-small molecules, KEGG, CSD, MMCD, Mass spectrophotometry, metabolic engineering, metabolomic analysis. Metabolite extraction. Bio informatics insights for designing biomaterials. NMR and GC-MS- Sugars, acyl carnitines, amino acids, glycerol phospholipids and sphingolipids. Analysis of plasma for metabolomics.

UNIT – V

Nano technology:

Bio and Non bio nanomaterials. Optical signals- Fluorescence, bio luminescence, sensors, photon counters. Electrical and electro chemical sensing – DC and impedance, passive electrodes based on interfacing, nano electrodes. Nano materials for bio applications. Characterization and applications in medicine.

REFERENCE BOOKS

- Genomics and proteomics – Functional and computational Aspects –Sandar sunai
- Bioinformatics –Concepts,Skill and Application –S,C Rastogi ,Namita mendritta,Parag Rastogi.
- Protein Biochemistry and Proteomics – Hubert Rehn
- Bioinformatics –Principles and Application –Harshawaedhan .P.Bal
- Practical Bioinformatics –Janusz M.Bujnicki
- Nanotechnology –Basic Science and Emerging Technologies-Rohit Majumdar
- Nanotechnology –Fundamentals and Application-Mansi Karkare
- Nanoscience and Technology –K.P.Mathar.
- Bioinformatics sequence and genome analysis ,Mount David .W.
- Introduction to proteomics.Tools for new biology .Liebler ,Humana
- Proteomics :from protein sequence to function S.Pennington
- Bioinformatics computing –Bryan Bergeron
- Metabolomics analytic solution –Donna.L.Wilson
- Metabolomics –Royston Goodacre

LAB COURSE -V

A)LABCOURSE

75 marks and 2 credits

I.Haematology

1. Enumeration of RBC and WBC
2. Differential count
3. Estimation of Haemoglobin-Colorimetric method and Shali's method
4. Determination of Bleeding time, clotting time
5. ESR,Heamatocrit and PCV

II Blood Analysis

1. Estimation of blood sugar,GTT,Glycosylated Hb
2. Estimation of total protein, Albumin, A: G ratio
3. Estimation of urea, Uric acid, creatine and creatinine
4. Estimation of Bilirubin (Conjugated and Unconjugated),Cholesterol,TG,HDL,LDL and VLDL
5. Determination of activity of CPK and LDH

6. Estimation of CU and Fe
7. Estimation of Vit A and Vit C

III.Urine Analysis

1. Estimation of Calcium
2. Analysis of Urinary Calculi.
3. Titrable Acidity of urine
4. Estimation of urea, Uric acid, creatine and creatinine
5. Estimation of phosphate

IV.Amniotic Fluid Analysis

B) INTERNSHIP –

25 Marks and 1 Credit

15 days training in a fully automated clinical laboratory

Note: Candidate must undergo an internship training programme for a period of 15 days in a reputed clinical lab

LAB COURSE –VI

1. Blood grouping and cross matching
2. Immunodiffusion – single and double immunodiffusion
3. Immunoelectrophoresis
4. Rocket immuno electrophoresis
5. Counter current immuno electrophoresis
6. Pregnancy test
7. Agglutination test
8. Immunoprecipitation test
9. VDRL test
10. ELISA

REFERENCE BOOKS

LAB COURSE V & LAB COURSE VI

- Practical Clinical Biochemistry, Volume I and II –Harold Varley
- Practical Immunology 4th ed by Frank C.Hay Olywn
- Practical Manual of Biochemistry – S.P Singh
- Laboratory Techniques in Biochemistry and Molecular biology ,Work and Work
- Modern Experimental Biochemistry ,Boyer .R

- A text book of Practical Biochemistry by David Plummer
- Laboratory Manual in Biochemistry by S.Jayaraman
- Biochemical methods by Sadasivam & Manickam
- Laboratory Manual in Biochemistry – T.N .Pattabiraman
- Handbook of Emergency Lab Test –L.I.G.Worthley
- Practical Immunology –Frank L.Hay ,Olwyn.M.R.Westwood

DRUG BIOCHEMISTRY AND TOXICOLOGY

UNIT – 1

Basic principles of medicinal chemistry:

History and development of medicinal plants, sources and classification of drugs. Routes of drugs administration, dosage forms. Drug distribution, pKa values, hydrogen bonding, protein binding, chelation, steric effect, surface activity. Mechanism of action of drugs, combined effect of drugs. Factors modifying drug action, tolerance and dependence. Pharmacogenetics.

UNIT – 2

Principles of basic and clinical pharmacokinetics:

Drug metabolism – general pathways of drug metabolism (different types of reaction in phase I and phase II with examples), metabolism and excretion of drugs. Adverse drug reactions and treatment of poisoning. Drug interactions, factors affecting drug metabolism including stereo chemical aspects, significance of drug metabolism in medicinal chemistry.

UNIT – 3

Systemic pharmacology:

Autonomic nervous system, central nervous system, autocoids, chemotherapy of parasite infections, chemotherapy of microbial diseases, immunomodulators. Gene therapy. Therapeutic gases. Free radical biology and antioxidants, pharmacology of biophosphonates, drug therapy in Alzheimer's disease and male sexual dysfunction.

UNIT – 4

General and systemic toxicology:

General toxicology: Basic principles of diagnosis. Mechanism of toxic effect, toxicokinetics – chemical carcinogens and teratogens, treatment of intoxication. Response of respiratory system, reproductive system, liver, kidney to toxic agents. Toxic effects of metals, solvents, environmental pollutants. Antidotes in the management of poisoning. Applied analytical toxicology and toxicovigilance.

UNIT – 5

Plant Therapeutics:

Basic constituents of plants (chemical classification). Isolation of active constituents from plant material. Percolation and maceration. Qualitative constituent characterization techniques. Utilization of HPTLC for the constituent analysis. Estimation of marker compounds on biological fluid after crude plant material.

Introduction and medicinal terminology – IT enabled services, need of medical transcription, equipments used. Medical terminology – word root, combining form, suffixes prefixes, formation and defining medical words.

REFERENCE BOOKS

- The Pharmacology volume I and II –Goodman and Gillman
- Basic Pharmacology –Foxter Cox
- Principles of medicinal chemistry By William.O.Foye,B.I.Waverks
- Burgers Medicinal chemistry and Drug discovery –Principles and Practice – Manfred.E.Wolf
- Oxford text book of Clinical Pharmacology and Drug Theraphy ,D.G Grahme Smithand J.K.Aronson
- Pharmacology and Pharmatherapeutics – R.S.Satoskar,S.D.Bhandhakarand
- Essentials of Pharmacotherapeutics ,Barav.F.S.K
- Introduction to medicinal chemistry ,Patrick.G.L.
- Lippincotts illustrated review Pharmacology ,Mary.J.Mycek,Richards ,Pamela.c

PAPERS TO BE SELECTED FOR EXTRA DISCIPLINARY HUMAN PHYSIOLOGY AND NUTIRITION

UNIT – I

Digestive and Excretory system:

Outline of digestive system. Mechanical digestion, Buccal, gastric and Intestinal digestion. Role of liver in digestion. Intestinal glands, hormonal control of digestion. Absorption and assimilation.

Structure of kidney and ultra structure of nephron. Formation and composition of urine. Outline of excretory system. Micturition. Hormonal regulation of kidney.

UNIT – II

Respiratory and Circulatory system:

Types of respiration. Outline of respiratory system, respiratory pigments, Transport of O₂ and CO₂. Factors affecting oxygen dissociation curve and Carbon dioxide dissociation curve. Chloride shift, Tidal volume, Vital capacity, Total lung capacity and dead space.

Circulatory organs, composition of blood, systemic, portal and pulmonary circulation, Heart beat, Cardiac cycle, origin and conduction of heart beat, Regulation of heart beat, human heart, coronary circulation, ischemic heart disease, ECG, Blood pressure and Cardiac output.

UNIT – III

Nervous and Muscular system:

Outline of nervous system, structure of neuron, types of neuron based on processes, function, histology and release of neurotransmitters. Conduction of nerve impulse transmission, synaptic transmission, neuro muscular junction and properties of nerve impulses. Reflex action.

Types of muscles, structure of striped muscle, ultra structure of muscle fibres, Z line, actin, troponin and tropomyosin. Properties of skeletal muscle. Muscle contraction: types, sliding filament theory, physico-chemical changes during muscle contraction.

UNIT – IV

Introduction on Nutrition:

Food factors for human being. Nutritional classification, foods, protein and energy requirements. Nutritive value of protein. Protein calorie malnutrition in children. Determination of energy value of foods. Physiological energy value and gross energy value of foods.

Basal metabolism: Definition, determination of basal metabolic rate (BMR). Standards of BMR. Factors affecting BMR, Specific dynamic action (SDA) and respiratory quotient.

UNIT – V

Nutritional consequences:

Infant nutrition, nutrition for preschool children, school children, adolescents, pregnant and lactating mothers. Industrial workers. Geriatric nutrition and Lathyrism. Obesity: Aetiology and occurrence, physiological regulation of foods intake assessment, complication, treatment and prevention of obesity. Therapeutic diets.

REFERENCE BOOKS

- Food Science ,Potter
- Text book of Medical Physiology –Guyton.A.C
- Human Physiology by Chatterjee

- Food facts and principles, Shakuntala Manay
- Modern nutrition in Health and disease ,Robert S. Goodhart, Maurice ,E. Shils
- Review of Medical Physiology by Ganong .W.F
- Concise Human Physiology ,Sukkar.M.y, EI-Munshid.H.A and Ardawi.M.S.M.
- Human nutrition and dietetics, S. Davidson and J.R. Passmore
- Modern nutrition in health and disease, Whol & Good hart
- Human nutrition and dietetics I.S. Garraw ,W.P.T. James

BIOMEDICAL INSTRUMENTATION

Unit I

Classification of biomedical equipment. Diagnostic, therapeutic and clinical laboratory equipment, bioelectric signals and their recording. Bioelectric signals (ECG, EMG and EEG) and their characteristics

Unit II

Biosensor-mechanism and types. Autoanalyser- types and application. Automatic tissue processing and application of microtome. Pulse oximetry – Introduction ,principle and clinical application of sphygmomanometer.

Unit III

X-ray machine, radiography, fluoroscopy. Conventional X-ray imaging . angiography, computer tomography and linear tomography. Ultrasonic imaging system. Physics of ultrasonic waves, medical ultrasound, different mode of operation of ultrasound – A scan, B scan, application of ultrasound scan, CT scan, MRI scan and echocardiography.

Unit IV

Introduction, characteristics, diagnostics and therapeutic application and advantage of pulsed ruby laser, ND-YAG laser, CO2 laser, argon laser and helium neon laser.

Introduction, types, merits, demerits, limitations, diagnostic and therapeutic application of endoscope, laparoscope and cardio scope.

Unit V

Therapeutic instruments. Introduction, types, life time, classification, power source and electrodes of cardiac pacemaker and defibrillators. Application of surgical diathermy equipment and haeme dialysis in medicine.

Computer application in medicine- computerized catheterization laboratory , computerized patient monitoring system.

REFERENCE BOOKS

- Medical Instrumentation by John .G.Webster
- Principles of applied Biomedical instrumentation by Goddess and Baker
- Hand book of medical instruments by R.S.Khandpur
- Medical Electronics and Instrumentation by Sanjay Guha
- Biomedical instruments by Cromwell
- Biomedical instrumentation and measurement by Carr and Brown

GENETICS FOR BIOLOGIST

UNIT – I

Mendelian Genetics: Mendel's works – Monohybrid and Dihybrid experiment .Mendel's Laws, terminology –Back/Test cross problems.Mendels law are Universal-Modification- Complete and incomplete dominance, Co dominance- Lethal factor,Non –allelic gene Interaction- complementary genes ,supplementary genes- inhibitory genes-Epistasis-Biochemical aspects – duplicating genes –Pleiotrophism.

UNIT –II

Para sexual process in bacteria; significance transformation, transduction, transfection and Conjugal gene transfer – the phenomena, mechanism and applications, kinetics of mating and transfer. Organization of chromosomes specialized chromosomes. Chromosome abnormalities, Sex –linked hereditary and quantitative inheritance .Gene conservation and generic load.

UNIT –III

Gene linkage –Types of Linkage, Complete and incomplete linkage, Theories and factors affecting Linkage, Linkage groups and Strength of Linkage. Crossing over, three point cross, tetrad analysis. Cytological Basis of Crossing over, Factors affecting crossing over, Significance.Sex determination- Thoeries

UNIT – IV

Genetic counseling: Possible approaches for tackling genetic disorders; Diagnosis of genetic defects; Positive eugenics, Negative eugenics, counseling, Genetic Drift. Principles of plant /animal breeding Techniques of plant breeding Goal and objective of plant breeding.-Methods of crop and livestock improvement

UNIT – V

Population genetics :Gene pool ,gene frequency, Hardy –Weinberg law ,no random mating ,Factors influencing allele frequency ,Heritability, genetic variation at the molecular level – Polymorphism paternity testing ; Use of VNTR ,Human genome organization ; Human Genome mapping

REFERENCE BOOKS

- Principles of Genetics by Gardner ,E.J.Simmons,M.J and D.P. Snustard
- Essentials of Genetics by Klug W.S and Cummings
- General Genetics Sub Owen and Edger
- Genetics by Peter .J.Russell
- Principles of Genetics by peter Snustad.D and Michael .J.Simmons
- Principles of Genetics Robert .H. Tamarin

HOSPITAL MANAGEMENT AND MEDICAL CODING

UNIT – I

Introduction on Hospital management: Eligibility and personal skills required for Hospital management .Job opportunities in Hospital management. Important hospital management Institutes in India and World . Hospital management. Concept of Modern Hospital & Privatization in Health Sector, Public Sector Hospitals and Level of care / offered facilities, Effects of Globalization in Health care,Concept of Corporate Hospital in developing countries,Infrastructure and lay out of an ideal corporate hospital,Functioning of modern hospitals & changing need of patients

Hospitality in Hospital Care,Invasive and non-invasive diagnostic facilities in modern hospital

. Care offered in Specialty and Super specialty Hospitals,

UNIT – II

Hospital management system : Benefits of Hospital management systems ,Modules of Hospital management system .Interfacing of analysert.Pathology lab management.Radiology ,Blood Bank ,Pharmacology management softwares

UNIT – III

History of Medical Transcription: Drawbacks of MRP system, Advent of Medical Transcription .Web friendly operating system, Market information on companies.

What Medical Transcription does? Benefits in a nut shell. Planning on Medical Transcription set up .Induction and orientation

UNIT – IV

Impact of Medical Transcription: Medical Transcription impact on its stakeholders. Impact during the implementation process. Impact on Departments, Organisation as a whole, Employment, Nature of job, Information access and Individual employees. Advantages in corporate entity, Disadvantages, conclusion

UNIT – V

Medical Transcription implementation : Medical Re engineering, Choosing appropriate transcription, Customise to suit the changes. Medical Transcription : Best practices, Costs, Failure, Gap analysis. Implementation, Life cycle. Medical Transcription- Trouble and their solutions.

REFERENCE BOOKS

- . Hospital Management module II- NIHFWS, New Delhi
- . Hospital Administration – G. D. Kundurs
- . Hospital Administration - Tabish

QUESTION PAPER PATTERN

BIOMOLECULES

TIME : Three hours

Maximum :75 marks

Section A

(5 x 5 = 25)

Answer ALL the questions

1. Describe the chemical reactions of monosaccharide.

(Or)

Write short notes on polyols

2. Explain the classification of amino acids with examples and structure.

(Or)

Explain amino acid sequencing

3. Discuss about the different model of cell membrane.

(Or)

Write notes on Glycoproteins

4. Explain about the difference structure of RNA

(Or)

Write short notes on slipped mispaired DNA

5. Explain about the structure, function and deficiency of vitamin A

(Or)

Explain about the structure, function and deficiency of vitamin D

Section B

(5 x10=50)

Answer ALL the questions

6. Describe the structure and functions of Polysaccharides.

(Or)

Explain Bacterial cell wall polysaccharides.

7. Elaborate the primary, secondary, tertiary & quaternary structure of protein and the force that determine folding and confirmation

(Or)

Write short notes on the following i) Ramachandran plot ii) Structure and function of hemoglobin

8. Write short notes on the following i) Cot curve value ii) Histone and Non histone proteins

(Or)

Write about the various transports across the cell membrane.

9. Explain the structure of Watson Crick model of DNA with diagram. add an account on other types

(Or)

Classify Lipids and explain the biological role of lipids

10. Write the structure of Vitamin A, E, B12, B2 and give the functions of each

(Or)

Explain the functions and deficiency disorders of sodium and potassium

ALL THE BEST

Cell and Molecular Biology

TIME : Three hours

Maximum : 75 marks

Section A

(5 x 5 = 25)

Answer ALL the questions

1. Describe the cell structure with neat diagram

(Or)

Explain the structure of mitochondria with neat diagram

2. Explain specialized junction

(Or)

Explain cell cycle

3. Explain Messelson and Stahls semi conservative replication

(Or)

Explain the process of replication in prokaryotes

4. Write notes on transcription factors in eukaryotes

(Or)

Explain Rho dependent and Rho independent transcription

5. Explain Holliday model of recombination

(Or)

Explain any two types of mutation with examples

Section B

(5 x10=50)

Answer ALL the questions

6. Discuss on cytoskeleton in detail

(Or)

Explain the various types of tissues

7. Explain Gap junction and tight junction

(Or)

Write detail note on Apoptosis

8. Give a detail note on RNA Replicase and Reverse Transcriptase

(Or)

Write about Post Transcriptional Modification

9. Give the salient features of genetic code and explain natural variation in genetic code

(Or)

Explain replication of mitochondrial DNA

10. Explain trp operon

(Or)

Explain DNA damage and repair

ALL THE BEST

ADVANCED ENZYMOLOGY

Section A (5 x 5 = 25)

TIME: Three hours

Maximum: 75 marks

Answer ALL the questions

1. Give short notes on Ribozymes

(Or)

Explain the following i) Abzymes ii) Units of enzyme activity

2. How will you determine the inhibitor constant (K_i) of different types of inhibition

Or

Explain the role of any 2 coenzymes with its structures

3. write short notes on feed back inhibition

(Or)

What is K_m ? What is the reason for deriving LB equation/

4. Derive Hill equation

(Or)

Explain the mechanism of Bi-substrate reactions

5. Write about the applications of immobilized enzymes

(Or)

What is the role of enzymes in food industries?

Section B

(5 x 10 = 50)

Answer ALL the questions

6. What is Active site? How will you determine the active site of an enzyme?

(Or)

Explain the following: i) Intracellular location of enzymes?

ii) Turn over number & its significance

7. Explain the mechanism of action of serine proteases

(Or)

What is the relationship between initial velocity and michaelis constant

8. Give detail account on Allosteric enzymes

(Or)

Explain the following i) Feed forward stimulation

ii) Metallo enzymes & metal activated enzymes

9. Explain the methods of immobilization of enzymes

(Or)

Define Biosensors & Explain the different types of Biosensors

10. Write about the applications of enzymes as analytical reagents

(Or)

Write about the applications of enzymes in medicine

ALL THE BEST

BIOPHYSICAL CHEMISTRY & BIOCHEMICAL TECHNIQUES

TIME: Three hours

Maximum: 75 marks

Section- A

(5 x 5 = 25)

Answer ALL the questions

1. Discuss the role of Buffers & Electrolytes in the body

(Or)

Write notes on electron microscope

2. Mention the principle & application of paper chromatography

(Or)

Mention the principle & application of affinity chromatography

3. Explain different types of gels. Give account of preparation & importance of polyacrylamide gel

(Or)

Give an account on Native gel

4. Explain how an enzyme can be assayed using UV-VIS Spectrophotometer

(Or)

List the differences between colorimeter and spectrophotometer

5. State Beer's law. Derive an expression for the relationship between absorbance and percentage transmission

(Or)

Enumerate on cation and anion exchangers with examples

Section -B

(5 x10=50)

Answer ALL the questions

6. Explain the working principle of buffer and derive the Henderson- Hesselbalch Equation

(Or)

Explain how molecular weight of a protein be determined using molecular Sieve chromatography

7. Describe the principle, procedure and applications of Gas-Liquid chromatography

(Or)

Describe the principle, procedure and applications of High performance liquid chromatography

8. Describe the principle, technique and applications of SDS-PAGE

(Or)

Enumerate the principle method and applications of Isoelectric focusing

9. Describe the principle, instrumentation & application of Mass Spectrometry

(Or)

Describe the principle, instrumentation & application of UV-VIS Spectrophotometry

10. Describe the principle, instrumentation & application of Flame photometry

(Or)

Give an detailed account on Biosensor

ALL THE BEST

PRACTICAL

PATTERN OF QUESTION PAPER-1

TIME : 6HOURS
MAXIMUM MARKS : 60

1. Effect of pH on peroxidase enzyme activity
(Or)
Immobilize the given enzyme entrapment method
2. Determine the activity of AST in given sample
(Or)
Determine the Molecular Weight of Enzymes by Molecular Sieve method

Total Max Marks: 60

Practical: 45Marks
Record : 10Marks
ViVa : 5 Marks

Scheme of valuation

EXPERIMENT –I (25 Marks) Quantitative Analysis

- | | |
|---------------------------|---------|
| 1. Principle & Procedure | 5 Marks |
| 2. Tabular column & Graph | 5 Marks |
| 3. Result | 15Marks |

EXPERIMENT –II (20 Marks) other experiments

- | | |
|-----------------|---------|
| 1. Principle | 5 Marks |
| 2. Procedure | 5 Marks |
| 3. Presentation | 5 Marks |
| 4. Result | 5 Marks |

PATTERN OF QUESTION PAPER -2

MAXIMUM MARKS : 30
TIME : 5HOURS

1. Isolate Genomic DNA from the given sample and confirm the presence of DNA
(OR)
Digest the DNA sample with given restriction enzyme and confirm the result by agarose Gel electrophoresis

Scheme of valuation

Practicals : 15 Marks
Record : 10Marks
ViVa : 5 Marks

Principle& Procedure: 5 Marks

Result : 5 Marks

Confirmation test: 5 Marks

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