M.Sc., BIOCHEMISTRY

I. SCOPE OF THE COURSE

The M.Sc., programme of two years in Vivekananda College of Arts and Sciences for Women 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 problems 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 opportunities in each area. Various practical courses have been designed not only to enable the students to appreciate scientific basis of various life processes 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 greater demand globally for trained manpower in the area of Biochemistry for Research and Development, in Multinational Companies, Public Sectors, Quality Control Labs, Biopharmaceuticals companies, Food industries as well as in Universities and the present curriculum will cater to that needs.

The course will provide solid foundation for all the students regardless of background and will gain a comprehensive understanding of the principles of Biochemistry to an advanced level, including clinical and research aspects and with the special attention to current development in the discipline.

II. SALIENT FEATURES

- Course is specially designed for a higher level Career Placement.
- Special Guest lecturers from Industrialists, Central Research Organizations and Universities will be arranged.
- Exclusively caters to students interested in pursuing professional exams like CSIR, NET, SLET etc.
- Special Industry Orientations and Training are parts of the Degree course.
- Project work is included in the syllabus to enhance conceptual, analytical and deductive skills.

III. OBJECTIVES OF THE COURSE

- Develop skills as a self-directed learner, recognize continuing educational needs; use appropriate learning resources and critically analyze relevant published literature in order to practice evidence-based biochemistry.
- To orient the students in the applied aspects of different advanced molecular techniques.
- To equip the students to occupy important positions in Research, Industries and related organizations.
- To inspire the students to apply their knowledge gained for the development of society in general.
- Facilitate learning of medical/nursing students, practicing physicians & paramedics as Teacher-Trainee.
- Play the assigned role in implementation of national health programs, effectively & responsibly.
- Develop skills in documentation of reports.

IV. ELIGIBILITY FOR ADMISSION

Candidates seeking admission to the first year M.Sc., Degree Course

A Bachelors Degree in Science with Biochemistry, Chemistry, Botany, Zoology, Nutrition and Dietics or Food and Nutrition or Food Sciences as the main subject or a Bachelors Degree in Agriculture and Life sciences as main subject of this University or any other qualification accepted as equivalent there to are eligible for admission to M.Sc., Degree course.

V. DURATION OF THE COURSE

The course duration shall be two years consisting of 4 semesters. Each academic year shall be divided into 2 semesters. The first academic year shall comprise the first and second semesters, and the second academic year the third and fourth semesters respectively. The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University. Each subject will have six hours of lecture per week apart from practical training at the end of each semester.

VI. CONTINUOUS INTERNAL ASSESSMENT

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

Attendance Marks (5 Marks)

S.No	Attendance Percentage	Marks
1	76 to 80	1
2	81 to 85	2
3	86 to 90	3
4	91 to 95	4
5	96 to 100	5

Theory Internal Marks (25 marks)

S.No	Segregation	Marks
1	Average of two Tests	10
2	Seminar	5
3	Assignment	5
4	Attendance	5
	Total	**25**

Practical Internal Marks (40 marks)

S.No	Segregation	Marks
1	Attendance	10
2	Observation note	10
3	Model Exam	20
	Total	**40**

VII. PASSING MINIMUM

EXTERNAL

In the University Examinations, the passing minimum shall be 50 % out of 75 Marks (38 Marks).

VIII. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on earning 75% of attendance and only when his / her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

IX. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks.

a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
c) 50% and above but below 60% shall be declared to have passed the examinations in second class.
d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

X. ELIGIBILITY FOR AWARD OF THE DEGREE

1. A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than two academic years comprising of four semesters and passed the examinations prescribed and fulfilled such conditions has have been prescribed therefore.

XI. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the university examination in the concerned subject in subsequent semesters and shall pass the examination.

XII. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2014-15 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2014-15 and thereafter.

XIII. AT THE END OF THE COURSE STUDENTS WILL

- Have a detailed knowledge of the applications of Clinical Biochemistry for the diagnosis and monitoring of human disease and its contribution to biomedical research.
- Understand the Medical, Scientific and Technological principles of Biochemistry and its interrelationship with other disciplines.
- Assess the effectiveness of individual biochemical tests, strategies and protocols for the investigation of disease.
- Acquire a detailed knowledge of laboratory techniques, instrumentation and informatics.
- Understand the principles of laboratory management
- Develop the clinical, scientific and Biomedical research skills.

These regulations shall take effect from the academic year 2014-15 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2014-15 and thereafter.

XIII. AT THE END OF THE COURSE STUDENTS WILL

- Have a detailed knowledge of the applications of Clinical Biochemistry for the diagnosis and monitoring of human disease and its contribution to biomedical research.
- Understand the Medical, Scientific and Technological principles of Biochemistry and its interrelationship with other disciplines.
- Assess the effectiveness of individual biochemical tests, strategies and protocols for the investigation of disease.
- Acquire a detailed knowledge of laboratory techniques, instrumentation and informatics.
- Understand the principles of laboratory management
- Develop the clinical, scientific and Biomedical research skills.
- Appreciate the new trends including molecular diagnostics and self testing.

SCHEME OF EXAMINATIONS – PG BIOCHEMISTRY
(For the candidates admitted during the academic year 2014-2015 onwards)

Sem	Subject code	Course	Subject title	Hrs/ week	Credit	Int. marks	Ext. marks	Tot. marks
I	14P1BC01	Core-I	Paper I – Biopolymers	6	5	25	75	100
	14P1BC02	Core-II	Paper II-Cellular Biochemistry	6	5	25	75	100
	14P1BC03	Core-III	Paper III- Enzymes and Enzyme Technology	6	5	25	75	100
	14P1BC04	Core-IV	Paper IV Analytical Biochemistry	6	5	25	75	100
	14P1BCP01	Core-V Practical	Practical –I	6	4	40	60	100
			Total	30	24	140	360	500
II	14P2BC05	Core-VI	Paper V- Intermediary Metabolism	6	5	25	75	100
	14P2BC06	Core-VII	Paper VI – Molecular Biology	6	5	25	75	100
	14P2BC07	Core-VIII	Paper VII- Advanced Endocrinology and Neurophysiology	6	5	25	75	100
	14P2BCP02	Core-IX Practical	Practical –II	6	4	40	60	100
	14P2BCE01	Elective-I	Elective I – Plant Biochemistry & Biotechnology	6	4	25	75	100
			Total	30	23	140	360	500
III	14P3BC08	Core-X	Paper VIII- Advanced clinical Biochemistry	5	4	25	75	100
	14P3BC09	Core-XI	Paper IX–Immunology	5	4	25	75	100
	14P3BC10	Core-XII	Paper X-Drug Biochemistry	5	4	25	75	100
	14P3BC11	Core-XIII	Paper XI -Genetic Engineering & Microbial Biochemistry	5	4	40	60	100
	14P3BCP03	Core-XIV - Practical	Practical –III	5	4	40	60	100
	14PAMBED1	EDC	Medical Laboratory Technology	4	4	25	75	100
	14P3BCI01	-	Internship Training	2 weeks	2	40	60	100
	14P3HR01		Human Rights	1	1	25	75	100
			Total	30	27	245	555	800
IV	14P4BCP04	Core-XV	Practical- IV	6	5	25	75	100
	14P4BCE02	Elective-II	Elective II – Bioinformatics & Nanotechnology	6	4	25	75	100
	14P4BCE03	Elective-III	Elective III – Research Methodology	6	4	25	75	100
	14P4BCPR1	Core-XVI	Project Work	12	4	40	60	100
			Total	30	17	115	285	400
Overall Total				120	91	640	1560	2200

PAPERS GIVEN BY THE BOARD AS ELECTIVE COURSE

- Plant Biochemistry & Biotechnology
- Bioinformatics & Nanotechnology
- Research Methodology
- Developmental Biology
- Microbial Techniques
- Ecology and Environmental biology

Semester: I	**Core Paper : I**
Paper Code: 14P1BC01	**Total Number of Hours : 75**
Credit : 05	**6Hours/ Week**

BIOPOLYMERS

Objectives:

On successful completion of the course the students should have understood the significance of the complex bio-molecules, polysaccharides, lipids,proteins, nucleic acids.

Unit-I **(15 Hours)**

Carbohydraretes- Introduction, Classification, and Properties of Mono, Di, Oligo and Polysaccharides, Bacterial cell wall Polysaccharides, Amino sugars and Deoxy sugars. Glycosaminoglycans-Structure and biological role of Hyaluronic acid, Chondroitin sulphate and Heparin. Sialic acid - Structure and Significance. Biological importance of Proteoglycans and Glycoproteins.

Unit-II **(15 Hours)**

Proteins and Amino Acids- Classification, Structure, Function, Properties of Aminoacids and Proteins. Amino acid sequencing, Biological importance of selenocysteine and desmosine. Ramachandran plot, Structure and Function of Hb, Actin, Myosin, Keratin, Collagen and Elastin. Transport of amino acid in to mitochondria.

Unit-III **(15 Hours)**

Lipids- Classification, Structure, Function, Properties of lipids; transport and hydrolysis of triglycerol. Plant and animal sterols.Structure and funtions of cholesterol. Lipid peroxidation and antioxidants. Lipoproteins- Classification and composition.

Unit-IV **(15 Hours)**

Nucleic Acids- Structure and properties of nitrogenous bases and nucleotides.Cot value and Cot curve.Chemical synthesis of DNA, major classes of RNA-mRNA,rRNA, tRNA,snRNA,hnRNA-Strucutre and biological functions. DNA histone proteins, chromatin, non-histone proteins. Methylated bases of DNA and DNA super coiling. Properties of DNA- buoyant density, viscosity, denaturation and renaturaion.

Unit-V **(15 Hours)**

Molecular Aspects of Proteins - Nucleic acid binding proteins – direct interactions. Techniques characterizing nucleic acid- protein complex- gel retardation assay.

TEXT BOOKS

1.Bery J.M., Tymoezko J.L. and Stryer L. (2008) **Biochemistry**, 5th Edition, W.H. Freeman

and Company, New York.

2. Deb, A.C (2004). **Fundamentals of Biochemistry.** 8th Edition, New Central Book Agency,

3. Jain, J.L & Jain, (2005) **Fundamentals of Biochemistry.** Sixth Edition,S.Chand & Company, New Delhi.

4.Eric E.Conn, P.K. Stumpf, G.Brueins and Ray, (2005). **Outlines of Biochemistry.** 5th Edition John Wiley and sons, Singapore.

5. U.Sathayanarayana,(2006). **Biochemistry.** 3rd Edition by Books and Allied (P) Ltd., India .

REFERENCE BOOKS

1. Murray, K.R. Granner, K.D.Mayes, P.A. and Rodwell W.V. (2009).**Harper's Biochemistry.** 23rd Edition, Prentice Hall International Inc.,New Jersey.

2. Nelson, D.L. and Cox, M.M (2008). **Lehninger Principles of Biochemistry**. 5th Edition, W.H.Freeman and Company, New York.

3. West, E.S., Todd, W.R., Mason, H.S. and Van Brugge, T.J. (1966), **Text book of Biochemistry** 4th Edition, The Macmillan Company, London.

4. Zubay, G. (1999). **Biochemistry**, 4th Edition, WCB. Mcgraw-Hill, New York.

5**.** Thomas,M. Devlin, A John Wiley,(1997).**Text book of Biochemistry.** 4th Edition, Inc Publication, New York.

Semester: I	**Core Paper : II**
Paper Code: 14P1BC02	**Total Number of Hours : 75**
Credit : 05	**6Hours/ Week**

CELLULAR BIOCHEMISTRY

Objectives:

On successful completion of the course the students should have: Understood the relationship between cellular organization and biological function of normal cell, pro and eukaryotic cells. Learnt on the various cell organelles with their functions and actions. Learnt the application of cell biology in research

UNIT-I **(15 Hours)**

Cellular Organization: Cell types - organization of prokaryotic and eukaryotic cells, cell division - mitosis and meiosis, cell cycle - phases of cell cycle, and regulation of cell growth and cell cycle, molecular motors, microtubular associated proteins - role in intracellular motility.

UNIT- II **(15 Hours)**

Cellular Organelles: Structure and composition of cytoskeleton-Actin filament, intermediate filament and microtubule- Nucleus - internal organization, traffic between the nucleus the nucleolus, and cytoplasm, endoplasmic reticulum, golgi apparatus and lysosomes, - protein sorting and transport. Morphology and function of mitochondria, chloroplasts, peroxisomes and glyoxysomes.

UNIT- III **(15Hours)**

Cellular Interaction: Cell – Cell and Cell - matrix adhesion: - An overview. Cell-Cell, interaction: Collagen, hyaluronan & proteolycans, laminin, integrins and fibronectins. Cell-Cell adhesion: Specialised junctions -- Desmosomes, Gap junctions, Adhesion molecules - Cadherins - Connexins.

Cell-Cel1 signaling – Types - Cell Signaling molecules and their receptors: functions of cell surface receptors, pathways, intracellular signal transduction and second messengers. (G – protein coupled receptors, receptor tyrosine kinases)

UNIT-IV **(15Hours)**

Programmed Cell Death: Apoptosis - Pathways, regulators & effectors in apoptosis. Cancer:- Properties of tumor cells, genetic basis and onset of cancer. Tumor viruses - DNA and RNA viruses as transforming agents - mechanism. Tumor suppressor genes and functions of their products. Carcinogenic effect of chemicals and radiation. Molecular diagnosis of cancer.

UNIT-V **(15Hours)**

Membrane Architecture And Functions: Membrane bilayer - Models, Membrane lipids - fluidity, Asymmetry phase transition,Liposomes Membrane proteins - Types, Orientation, Mobility – Experiments. Bacteriorhodopsin, Porins-aquaporin. RBC ghosts, solubilisation of proteins, lipid anchored proteins carbohydrates and cell surface carbohydrates –

Lectins.Membrane transport- ion channels- symporters and antiporters. Transport of water, glucose and amino acids.

TEXT BOOKS

1. Rastogi,S.C. (2003), 2nd Edition, **Cell and Molecular Biology**. New Age International Publishers,New York.
2. Geoffrey, M. Cooper and Robert E. Hausman, **The Cell: A Molecular Approach**.4th Edition,Asm Press,USA.
3. Gerald Karp, (2008**). Cell and Molecular Biology.** 5 th Edition, John Wiley and Sons New Jersey.
4. Ajay Paul, (2009).**Text Book of Cell and Molecular Biology.** 2 th Edition, Books and Allied (P) Ltd, Kolkata.

REFERENCE BOOKS

1. Lodish, H. Baltimore, and *et al*., (2008).**Molecular Cell Biology.** 6th Edition. W.H.Freeman and Co, NY.
2. J. Brachet and A. E. Mirsky (1963). **The Cell** , Biochemistry, Physiology and Morphology , Academic Press.
3. Garrette, Grisham (1994) **Principles of Biochemistry**, Saunders College Publishing Co. USA.
4. Kelein Smith, and M Kish, (1995).**Principles of Cell Biology,** 2nd Edition, Harper and Row Publisher.

ENZYMES AND ENZYME TECHNOLOGY

Objectives:

On successful completion of the course the students will acquire knowledge about Techniques of isolation & purification of the enzymes. Kinetics of the enzymes Enzymes that are used in medicine and industry.

UNIT I **(15 Hours)**

Enzymes- Introduction, Classification of enzymes by IUB system. Factors affecting enzyme activity.Active site- Definition: investigations of active site structure, Trapping ES complex, use of substrate analogues. Enzyme modification by site directed mutagenesis. Isoenzymes and Multienzyme complex.

UNIT II **(15 Hours)**

Enzyme Catalysis-Acid base catalysis and covalent catalysis. Mechanisms of action of lysozyme and chymotrypsin. Metal activated enzymes. Role of metal ions in carbonic anhydrase, superoxide dismutase,carboxy peptidase, Coenzymes and cofactors in enzyme catalysed reaction,

UNIT III **(15Hours)**

Enzyme Kinetics- MM Kinetics, LB plot, Eadie - Hofstee plot and Hanes plot and Hill plot. Bisubstrate reaction. Effect of pH, temperature, substrate and enzyme concentration on the rate of enzyme reaction. Types & kinetic differentiation of competitive, uncompetitive, non-competive inhibitions. Allosteric inhibition and regulation.

UNIT IV **(15 Hours)**

Immobilised Enzymes- Techniques of immobilization and applications of immobilized enzyme. Enzymes as diagnostic reagents. Biosensors- calorimetric biosensors, potentiometric biosensors, Amperometric biosensors and immunosensors. Applications of Monoclonalantibodies. Therapeutic proteins- Blood products, anticoagulants.

UNIT V **(15 Hours)**

Biotechnological Applications of Enzymes-Application of enzymes-Enzymes as analytical reagents, Enzymes as thrombolytic agents and anti-inflammatory agents. Enzymes in Medicine and industry, Biotechnological applications of enzymes in textiles and leather industries.

TEXT BOOKS

1. Nicholas, C. Price , (1998).**Fundamentals of Enzymology.** 2nd Edition, Oxford University Press. UK
2. Trevor Palmer, (2004). **Enzymes.** 5th Edition, Affiliated East –West press (P)Ltd. New Delhi.
3. Gary Walsh, Denis and Headon, (2002). **Protein Biochemistry and Biotechnology.** John Wiley and sons Ltd. USA.
4. Dixon, E.C.Webb , (1979). **Enzymes.** 3rd Edition**,** CJR thorne and K.F.Tipton, Longmans Green & Co , London and Academic Press, New York.
5. Ashok Pandy, Colin webb, Carlos Ricardo Soccol, Christian, (2005). **Enzyme Technology.** Asiatech Publishers, Inc., New Delhi.

REFERENCES BOOKS

1. Chapline, M.F. Bucke, C. (1990). **Enzyme Technology.** 1st Edition, Cambridge University Press. New York.
2. Chapline, Bucke C, (1990). **Protein Biotechnology.** 1st Edition, Cambridge University Press, New York.

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Semester: I **Core Paper : IV**
Paper Code: 14P1BC04 **Total Number of Hours :75**
Credit : 05 **6Hours/ Week**

ANALYTICAL BIOCHEMISTRY

Objectives:

On successful completion of the course the students would have Learnt the principles and applications of the instruments.

Unit I **(15Hours)**

pH and Buffers– Measurement of pH, biochemical buffers, selection of biochemical buffer, oxygen electrode.. Cell disruption methods: French press, sonication, freeze-thaw techniques, enzymatic method and use of liquid nitrogen.

Unit II **(15Hours)**

Centrifugation – Basic principles of sedimentation, types of centrifuges and rotors. Preparative ultracentrifugation - differential centrifugation, density-gradient and analytical ultracentrifugation and applications in determination of molecular weight.

Electrophoresis techniques - Principle and technique of paper, Native PAGE gels – SDS-PAGE and High voltage and discontinuous electrophoresis. Isoelectric focusing. Pulse field electrophoresis. Capillary electrophoresis, Immunoelectrophoresis.

Unit III **(15Hours)**

Chromatography: Separation methods - General principles and definitions. Methods based on polarity – partition chromatography (Paper chromatography), adsorption chromatography (thin-layer chromatography), gas-liquid chromatography. Methods based on size - principle of Gel filtration, methodology and applications. Methods based on affinity – principle of Affinity chromatography, methodology and applications (purification of proteins and nucleic acids). High-performance liquid chromatography (HPLC) - principle, instrumentation, practical procedure and applications. Ion-exchange chromatography – principle, ion exchangers, methodology.

Unit IV **(15 Hours)**

Spectroscopic Technique: Basic principles, instrumentation and applications of UV, visible and IR spectrophotometers. Electron spin resonance, Nuclear Magnetic Resonance, Mass Spectrometry, light scattering and Raman spectroscopy. Flame Photometry – principles and applications. Electron microscope – principle, instrumentation and application of SEM and TEM.

Unit V **(15Hours)**

X-rays, X-ray Diffraction: X-ray fluorescence, crystals and detectors – quantitative analysis and applications. ORD and circular dichroism – principles and applications. Application of radioactive and stable isotopes in biological research. Nature and units of radioactivity. Radiochemical methods: basic concepts, counting.methods and applications, Autoradiography.

TEXT BOOKS

1. Keith Wilson, and John Walker, (2010). **Principles and Techniques of Practical Biochemistry.** 7th edition, Cambridge University Press. UK.

2. Avinash Upadhyaye, and Nirmalendhe Nath, (2002). **Biophysical Chemistry Principles and Techniques.** 3rd edition, Himalaya Publishers,New Delhi.

3. Keith Wilson and Kenneth, (1994). **Goulding A Biologist Guide to Principles and Tecchniques of Biochemistry,** EdWard Arnold Publishers. UK.

4.Gurdeep, R. Chatwal, and Sham, K. Aanand, (2006). **Instrumental Methods of Chemical Analysis.** Himalaya publishing House, New Delhi.

REFERENCE BOOKS

1. Wilson and Walker, (2000). **Practical Biochemistry: Principles & Techniques.** 5th Edition Cambridge Univ. Press, New York.

3 .Pattabhi,V and Gautham, N. (2002). **Biophysics.** Narosa Publishing House, New Delhi.

4. Subramanian, M.A. (2005). **Biophysics : Principles and Techniques**. MJP Publishers, Chennai.

Semester: II **Core Paper : V**
Paper Code: 14P2BC05 **Total Number of Hours :75**
Credit : 05 **6Hours/ Week**

INTERMEDIARY METABOLISM

Objectives: Provides much information related to carbohydrate, fat and protein metabolism that takes place in our body.Interrelationship between carbohydrate, fat and protein metabolism. Role of purine and pyrimidines in nucleic acid metabolism.

Unit-I **(15 Hours)**

Bioenergetics and Biological Oxidation : Free energy and entropy. Phosphoryl group transfers and ATP. Enzymes involved in redox reactions. The electron transport chain - organization and role in electron capture. Mechanism of Electron transport chain and oxidative phosphorylation - The chemiosmotic theory. Inhibitors of respiratory chain and oxidative phosphorylation - Uncouplers and Ionophores. Regulation of oxidative Phosphorylation. Mitochondrial transport systems - ATP/ADP exchange, malate / glycerophosphae shuttle.

Unit-II **(15 Hours)**

Carbohydrate Metabolism: An overview and energetic of glycolysis and gluconeogenesis-Regulation of glycolysis and gluconeogenesis. Metabolism of glycogen and its regulation.. TCA cycle steps and its regulation . The glyoxalate pathway. Cori cycle. Anaplerotic reactions. Metabolism of fructose, galactose and mannose. Lactose and glycoprotein synthesis. Synthesis of bacterial cell wall polysaccharides.

Unit-III **(15 Hours)**

Lipid Metabolism: An overview of fatty acid metabolism. Regulation of fatty acid synthesis-control of acetyl CoA carboxylase line on fatty acid synthase complex. Oxidation of saturated and unsaturated fatty acids. Oxidation of fatty acids with even and odd numbered carbon atoms. Alpha, beta and omega oxidation. Regulation of biosynthesis of triacylglycerols, cholesterol, phosphatidyl choline and sphingomyelin. Biosynthesis and regulation of prostaglandins, Eicosanoids, thrombaxanes and leucotriens.

Unit IV **(15Hours)**

Amino acid Metabolism: An overview of gamma glutamyl cycle. An overview- Methionine methyl donor (SMP pathway). Urea cycle and its regulation. Degradation of aminoacids-transamination, decarboxylation, oxidative and non-oxidative deamination. Catabolism of aminoacids- carbon skeleton of amino acids to amphibolic intermediates. Inter relationship between carbohydrates, proteins and fat metabolism. Conversion of amino acids to specialized products: Serotonin, GABA, dopamine, epinephrine, nor-epinephrine, melanin, creatinine and creatine.

Unit V **(15 Hours)**

An Overview On Porphyrine Metabolism Regulation, biosynthsis and degradation of Hb, chlorophyll and cytochrome. Nucleic acid metabolism, Biosynthesis and degradation of purines and pyrimidines (Denovo and Salvage pathway). Regulation of Pyrimidine biosynthsis: aspartate carbomoyltransferase. Biosynthesis and degradation of porphyrin - formation, transport and excretion of bile pigment.

TEXT BOOKS

1.Nelson, David, L. and Cox, (2008). **Lehninger principles of Biochemistry.** 5th Edition, W.H.Freeman and Co., New York.

2.Donald Voet, Judith, G. Voet, and Charlotte, W Pratt, (2008).**Fundamentals of Biochemistry,** 3rd Edition. John Wiley &Sons, New Jersey.

3.Eric, E. Conn, P.K. Stumpf, G. Brueins, and Ray, H. Doi, (2005).**Outlines of Biochemistry.** 5th Edition, John Wiley and sons, Singapore.

4.Lubert Stryer, (1995). **Biochemistry.** 4th Edition .WH freeman and co, Sanfrancisco.

5.Thomas, M. Devlin, (1997).**Text book of Biochemistry.** 4th Edition A John Wiley, Inc Publication, New York.

6.Zubay G L, (1988). **Biochemistry.** 4th Edition . W M C Brown Publishers, USA.

REFERENCE BOOKS

1. Devlin, T.M.(2002) **Textbook of Biochemistry with Clinical Correlations.** John Wiley and sons, INC. New York.

2. Bowsher, C,Steer, M. and Tobin, A (2008). **Plant Biochemistry.** Garland Science, Taylor and Francis Group, LLC. New York.

3. Robert Murray, Bender, (2012) **Harper's Illustrated Biochemistry.**McGraw Hill.

Semester: II	**Core Paper : VI**
Paper Code: 14P2BC06	**Total Number of Hours :75**
Credit : 05	**6Hours/ Week**

MOLECULAR BIOLOGY

Objectives: On successful completion of the course the student should have Understood the synthesis of genetic material, RNA and proteins. Learnt about gene repair mechanism and gene mutation. Learnt about the techniques used in identifying gene mutation.

UNIT-I : **(15 Hours)**

DNA Replication: Types of replication, evidence for semi conservative replication - Meselson and Stahl experiment, replications in circular chromosomes - Cairns model, rolling circle model. Enzymology of Replication, Replication in prokaryotes and inhibitors of replication. Replication in RNA virus, plasmid replication (x174, nl3 A. DNA) reverse transcriptase, retroviruses, Eukaryotic replication.

UNIT-II : **(15Hours)**

Transcription: Structure and function of RNA polymerases, Initiation, elongation and termination of transcription, Post transcriptional modification, Inhibitors of transcription, Ribozymes, RNA Replicase.

UNIT-III : **(15 Hours)**

Genetic Code and Translation: Genetic code - definition, deciphering of the genetic code, codon dictionary, salient features of genetic code. structure of tRNA, activation of enzymes, binding of amino acids to tRNA, wobble mechanism and its significance, composition of prokaryotic and eukaryotic ribosomes, prokaryotic and eukaryotic protein biosynthesis - initiation, elongation, translocation and termination, post-translational modifications in prokaryotes and eukaryotes. Inhibitors of protein synthesis.

UNIT-IV : **(15Hours)**

Protein Transport and Gene Expression: Protein targeting, translocation, heat shock proteins, glycosylation, SNAPs and SNAREs, bacterial signal sequences, mitochondrial, chloroplast and nuclear protein transport, endocytosis-viral entry, ubiquitin TAG protein destruction, gene expression and regulations, molecular mechanism of regulation, prokaryotes - operon model, lac, trp, arabinose operons, repression and attenuation, eukaryotes - C value paradox, repetitive DNA, gene dosage and gene amplifications.

UNIT-V : **(15 Hours)**

DNA Damage and Repair

DNA damage - different types, DNA repair - direct reversal repair, direct repair of nicks, excision repair, nucleotide excision repair, mismatch repair, recombination error, SOS response and mutagenic repair.

TEXT BOOKS

1. D.L. Nelson and M. M. Cox (2008).Lehninger's **Principles of Biochemistry** 5th Edition. Freeman Publishers. New York.
2. Donald Voet, Judith, G. Voet and Charlotte W Pratt, (2008) **Fundamentals of Biochemistry.** 3rd Edition. John Wiley & sons Inc**.** New York
3**.** Gerald Karp (2008**) Cell and Molecular Biology.** 5 th Edition**,** John Wiley and Sons Inc.
4. Ajay Paul, (2009).**Text book of Cell and Molecular Biology.** 2nd Edition, Books and Allied (P) Ltd, Kolkata.

REFERENCE BOOKS

1. David Friefelder, (1987). **Molecular biology.** 2ndEdition,Narosa Publishing House, New Delhi.
2. E D P de Robertis and E M F de Robertis, (2001).**Cell and Molecular Biology**. 8th Edition, Lippincott W&W.
3. Weaver, R.F.(2005). **Molecular Biology.** 3rd Edition. Tata Mc Graw - Hillcompanies, Inc India.

Semester: II **Core Paper : VII**
Paper Code: 14P2BC07 **Total Number of Hours :75**
Credit : 05 **6Hours/ Week**

ADVANCED ENDOCRINOLOGY AND NEUROPHYSIOLOGY

Objectives: On successful completion of the course the students should have understood clearly on various alimentary parts of human body. Learnt more specific on the endocrinal activities Learnt the mechanisms and actions of vital organs

UNIT I **(15 Hours)**

Hormones: Introduction, chemical structure. Hormones and homeostasis. Neuroendocrine integration in homeostasis. Classes of chemical messengers. Hormone secretion. Transport and clearance. Hormones and behavior. Feed back control of secretion, Mechanism of hormone action –receptors. Second messengers. Cytosolic hormone receptors: Eicosonoids and hormone action. Hormone bioassay-RIA and ELISA.

UNIT II **(15 Hours)**

Pituitary Hormones: Anatomy of pituitary gland, hormones of the pituitary, pathophysiology. Endocrine hypothalamus- structure, hypophysiotropic hormones, control of hypothalamic hormone secretion. Feed back mechanisms. mechanism of action. Neurohypophysis: Synthesis, chemistry and control of neurohypophyseal hormone secretion. Roles, mechanism of action and pathophysiology of oxytocin, vasopressin. Somatotropins and somatomedins. Growth factors-neurotropic growth factors, hematopoietic growth factors

UNIT III **(15 Hours)**

Thyroid and Parathyroid Gland: Synthesis and chemistry of hormones, control of thyroid hormone secretion, circulation and metabolism, physiological roles, mechanism of action. Pathophysiology. Physiological role of vitamin D. Mechanism of action of calcium homeostasis and pathophysiology. Melanotropic hormones- chemistry, role of MSH, mechanism of action and pathophysiology. Pineal gland - melatonin hypothesis, melatonin secretion and circulation, proposed role of pineal gland and mechanism of action.

UNIT IV **(15 Hours)**

Pancreas: Endocrine pancreas, insulin, glucagons and somatostatin. Pancreatic peptide – chemistry, physiological roles and mechanim of action. Catecholamines - synthesis, chemistry and metabolism. Neurohormones- endorphins-source, chemistry, control of secretion, physiological roles, mechanism of action and pathophysiology.

UNIT V **(15Hours)**

ReproductiveEndocrinology: Male reproductive system- source, synthesis, chemistry, metabolism of androgens, physiological roles, mechanism of action and pathophysiology. Female reproductive system- Ovarian steroid hormone synthesis, physiological role, mechanism of action and pathophysiology. Endocrinology of pregnancy, parturition and lactation. Sex

differentiation and development. Puberty and hormone control. Human infertility – reasons, therapy and treatment.

TEXT BOOKS

1. Murray, K.R., Granner, K.D., Mayes, P.A. and Rodwell, W.V. (2009) **Harper's Biochemistry**, 28th Ed, Appleton & Lange Stamford, Connecticut.

2.Guyton, A.C. and Hall, J.E (2006), **Textbook of Medical Physiology**, 11th Edition, Saunders Co. Pennsylvania.

REFERENCE BOOKS

1.Foye, O.W., Lemke,J.L. and William D.A. (1995), **Medicinal Chemistry**,B.I.Waverly Pvt. Ltd., New Delhi.

2.West, E.S., Todd, W.R., Mason, H.S. and Van Brugge, T.J. (1966), **Biochemistry**. 4th Edition, The Macmillan Company, London.

Semester: II **Elective : I**
Paper Code: 14P2BCE01 **Total Number of Hours :75**
Credit : 05 **6Hours/ Week**

ELECTIVE I

PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

Objectives: On successful completion of the course the students should have understood the components of culture media and various tissue culture techniques.Learnt about the technique of genetic engineering in plants and animals**.**

UNIT-I **(15 Hours)**

Photosynthesis: Photosynthetic apparatus; organisation of thylakoid, role of chlorphylls, carotenoids and other photosynthetic pigments, light absorption and energy conservation. Light – properties of both particle and wave, light absorption by pigment molecules. The photosystems I and II. Electron transport pathways in chloroplast membranes. ATP synthesis in chloroplasts, cyclic and noncyclic photophosphorylation

UNIT-II **(15 Hours)**

Carbon Reactions: C3, C4 and CAM plants - Calvin cycle; Hatch-Slack pathway. Photorespiration, in plants, biochemical basis of PR pathway – C2 cycle. Pathways of glucose oxidation in plants, starch biosynthesis and degradation, metabolic transport between organelles. Overview of lipid and protein metabolism in plants.

UNIT-III **(15 Hours)**

Nitrogen Fixation : Symbiotic and non-symbiotic. Symbiotic nitrogen fixation in legumes by Rhizobia – biochemistry and molecular biology of nitrogen fixation – enzymology of nitrogen fixation; regulation of *nif* and *nod* genes of nitrogen fixation. Interaction between nitrate assimilation and carbon metabolism. Sulphur chemistry and functions; reductive sulfate assimilation pathway. Synthesis and functions of glutathione and its derivatives.

UNIT-IV **(15Hours)**

Structure of Plant Genes:. Organisation of plant chromatin. The nuclear, chloroplast and mitochondrial genomes. Interaction between nuclear and organelle genome Biosynthesis of organelles – development of chloroplast and plastids. Gene transfer to plants- *Agrobacterium* mediated transformation – Ti plasmids Ri plasmids. Direct DNA transfer to plants – protoplast transformation. Plant viruses as vectors – CaMV, Gemini viruses, RNA viruses (TMV, p otato virus X) as vectors. Advantages and uses of transgenic plants.

UNIT-V **(15 Hours)**

Plant Cell Culture:. Tissue culture media – composition and preparation. Micropropagation; somoclonal variation. Callus. Protoplast culture - isolation and purification of protoplasts. Protoplast fusion; genetic modification of protoplasts. Anther, pollen and ovary culture for production of haploid plants and homozygous lines. Uses of haploids in plant breeding.

TEXT BOOKS

1.Heldt, HW. (2005), **Plant Biochemistry.** 3rd Edition, Elserveir Academic Press Publication, USA.

2.Lea, P.J. and Leegood, R.C.(1999). **Plant Biochemistry and Molecular Biology.** 2nd Edition, Wiley and Sons, New York.

3.Harborne, J.B. (1989). **Methods in Plant Biochemistry in Plant Phenolics.** Academic Press, London, Uk.

4.Goodwin Ane Mercer,(2003).**Introduction to Plant Biochemistry.**2nd Edition,CBS Publishers, New Delhi.

REFERENCE BOOKS

1.Hans,Walter-Heldt,(1997).**Plant Biochemistry and Molecular Biology**. 3rd Edition Academic Press, California.

2.Nicholls (2002). **Genetic Engineering.** 2nd Edition,Cambridge University Press. UK.

3.Primrose (2001) **Principles of Gene Manipulation**. 6th Edition Blackwell Scientific Publishers. UK.

4.Jeffrey,W. Pollard, and John, M. Walker, (1997). **Basic Cell Culture Protocol.** 2nd Edtion, Humana Press Totawa, New Jersey.

5.Narayanaswamy, S. (1999). **Plant Cell and Tissue Culture.** 2nd Edition,Tata McGraw Hill Publishing Company Ltd, New York

Semester: I	**CorePractical Paper : I**
Paper Code: 14P1BCP01	**Total Number of Hours :90**
Credit : 04	**6Hours/ Week**

PRACTICALS – I

1. Isolation and estimation of glycogen from liver.
2. Isolation and estimation of Starch from Potato.
3. Isolation and estimation of DNA from liver and spleen
4. Estimation of RNA
5. Isolation of lecithin from egg yolk.
6. Estimation of Sodium & Potassium by Flame photometry.
7. Isolation and estimation of ascorbic acid from fruit
8. Estimation of lactose from milk
9. Separation of amino acids by Paper chromatography
10. Estimation of Calcium from milk by titrimetry.

REFERENCE BOOKS

1.Harold Varley, (1980). **Practical Clinical Biochemistry, Volume I and II**. 5th Edition. CBS Publishers. New Delhi.

2. Jayaraman, S. (2003). **Laboratory Mannual in Biochemistry**. 2nd Edition .New Age International (P) Limited. New Delhi

3. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2nd Edition. New Age International (P) Limited. New Delhi.

SEMESTER :II	**CORE PRACTICAL PAPER:II**
PAPER CODE: 14P1BCP02	**TOTAL HOURS: 45HRS**
Credit : 5	**Hrs/ week: 5 hours**

PRACTICALS – II

Enzyme Studies:

I.Kinetic (Effect of pH,Temperature and Substrate concentration-MM Plot, V max) studies of

1. Peroxidase
2. Amylase
3. Urease
4. Alanine Phosphatase
5. Acid Phosphatase (Effect of pH and Temp)

II. Immobilised Enzyme Reactions

6. Techniques of enzyme immobilisation-matrix entrapment, ionic and cross linking
7. Bioconversion studies with immobilised enzyme

III. Separation of Isoenzymes

8. Seperation of LDH by SDS-PAGE.

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1.David, T. Plummer, (1988). **An Introduction to Practical Biochemistry**. 3rd Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.

2. Pattabiraman, T.N. (1998). **Laboratory Manual in Biochemistry**. 3rd Edition. All India Publishers and Distributors. Chennai.

3. Jayaraman, S. (2003). **Laboratory Mannual in Biochemistry**.2nd Edition. New Age International (P) Limited. New Delhi

4. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2nd Edition. New Age International (P) Limited. New Delhi.

Semester: III	**Core Paper : X**
Paper Code: 14P3BC08	**Total Number of Hours :75**
Credit : 04	**5Hours/ Week**

ADVANCED CLINICAL BIOCHEMISTRY

Objectives:

This course would have made the students understand the significance of diagnostic biochemistry.

UNIT – I **(15 Hours)**

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 – II **(15 Hours)**

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

UNIT –III **(15 Hours)**

Disorders of animoacids 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.

UNIT – IV **(15 Hours)**

Renal function test: Osmolarity and free water clearance, acute and chronic renal failure, renal hypertension, glomerulonephrities, nephritic syndrome, 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.

UNIT – V **(15 Hours)**

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

TEXT BOOKS

1.N.W.Teitz, (1994). **Textbook of Clinical Chemistry and Molecular Diagnostics**, Fifth Edition W.B. Saunders company

2.Harold Varley (1988). **Practical Clinical Biochemistry**, volume I and II 4th Edition, CBS Publishers New Delhi

3.Foye, O.W., Lemke,J.L. and William D.A. (1995). **Medicinal Chemistry**, B.I.Waverly Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1.Philip. D. Mayne (1994). **Clinical Biochemistry in Diagnosis and Treatment** 6th Edition ELBS Publication

2. William J.Marashall and Stephen K bangert, (1995). **Clinical Biochemistry** – Metabolic and clinical aspects, Pearson Professional Ltd

3. A.C. Guyton & J.E.Hall, (2006). **Text Book of Medical Physiology** 11th Edition Harcourt Asia.

4. Thomas M.Devlin,(2010). **Text book of biochemistry with clinical correlations** 7 th Edition John Wiley & Sons

5. Praful B. Godkar, Darshan P. Godkar(2014) **Textbook of Medical Laboratory Technology : Clinical Laboratory Science and Molecular Diagnosis** 3rd Edition, Bhalani Publishing House

WEB REFERENCE

1. *www.medicinenet.com › ... › diabetes az list › diabetes mellitus index*
2. www.mayoclinic.org/diseases-conditions/diabetes/basics/.../con-2003309...
3. *www.niams.nih.gov ›*
4. www.nios.ac.in/media/documents/dmlt/Biochemistry/Lesson-25.pdf
5. www.arup.utah.edu/education/automation.php
6. *www.bmb.leeds.ac.uk/illingworth/metabol/amino.htm*

Semester: III	**Core Paper : XI**
Paper Code: 14P3BC09	**Total Number of Hours :75**
Credit : 04	**5Hours/ Week**

IMMUNOLOGY

Objectives:

On successful completion of the course the students should have:Understood the foundation for the future subjects in microbiology and immunology. Learnt the basic terminology and techniques in microbiology and immunology. Learnt on how much immune system is important to the humans.

Unit I **(15 Hours)**

Basic concepts of immunology- types of immunity, components of immune system, haematopoisis. 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,haptens, cross reactivity, adjuvant, super antigen, and mechanism of immunity to infection.

Unit II **(15 Hours)**

Antibodies- Structure, theories of antibody formation - side chain and clonal selection theory, classes,immunoglobulin super family, generation of antibody diversity, primary and secondary immune response, kinetics, antigen recognition, antigen processing and antigen presentation, activation of B cells and T cells, lymphocytes and cytokines. Biology of the complement system, MHC complex class I, II and III molecules,

Unit III **(15 Hours)**

Hyper sensitivity- types 1 to 5, mechanism, assay and treatment. Immunotolerence, autoimmune disorders. Immunization –active and passive immunization, vaccines toxoids, recombinant vaccines. Hybridoma technology – monoclonal antibodies production and application in biomedical research.

Unit IV **(15 Hours)**

Immunology disorders- B cell deficiencies, T cell deficiencies, secondary immuno deficiency diseases – AIDS- HIV lifecycle, pathogenesis, immunological abnormalities, diagnosis and treatment, AIDS vaccine.
Transplantation immunology- allograft, typing – HLA typing and GVH reaction, organ transplantation, and immune suppressive therapy

Unit V **(15 Hours)**

Isolation and characterization of immune cells. Macrophage culture and assay of macrophage activation. Purification and quantification of antibody RID, EID, Nephlometry. Tumor immunology - immune surveillance, tumor antigens, immune response to tumors,immunotherapy of tumors.

TEXT BOOKS

1.Tizard(1984).**An Introduction Immunology**: Tizard K, Saunders college Publishing

2.Immunology Roitt. Brostoff and David(1998). **Immunology**, 4th Edition, Mosby Times Mirror Int Pub Ltd.

3. KubyRichard, (2000)**. Immunology**, 4th Edition, W.H. Freeman and Company, NewYork.

4.Abbas *et al.*, (1994). **Cellular and Molecular Immunology** 2nd Edition, W.S.saunders

5.Janeway Jr.Paul., (2001). **The Immune System in Health and Disease**. Travels and Co.,

REFERENCE BOOKS

1 . KubyRichard, (2000). **Immunology**, 4th Edition, W.H. Freeman and Company, NewYork.

2. Stites D.P. Stobo, J.D.Fundanberg. H.A and Wells. J.V. (1990) **Basic and Clinical Immunology**. 6th Edition Los AtlasLange.

3 Charles. A.Janeway, (1994). J.R. Paul **Immunology** 4th Edition. Black well Scientific Publishers,

4. Virella, (1999)**Introduction to Medical immunology** 4th Edition, , Marcel Dekker Ltd.,

WEB REFERENCE:

1. www.microbiologybook.org/mayer/ab-ag-rx.htm
2. www.ebi.ac.uk/interpro/potm/2005_2/Page1.htm
3. www.quickhack.net/
4. https://www.sciencebasedmedicine.org/
5. www.slideshare.net/...
6. https://www.aids.gov/**hiv**-aids-basics/
7. *www.keepachildalive.org/*

Semester: III	**Core Paper : XII**
Paper Code: 14P3BC10	**Total Number of Hours :75**
Credit : 04	**5Hours/ Week**

DRUG BIOCHEMISTRY

Objectives On successful completion of the course the students should have Understood the development of the traditional and modern methods used for drug discovery; of how molecules interact. Learnt the fact that the pharmaceutical industry is by far the largest employer of

Medicine Learnt and developed skills in the use of reaction mechanisms and how knowledge of reaction mechanisms can aid in understanding the mode of action of a drug, and the method by which it can be synthesized, and developed.

UNIT- I **(15 Hours)**

History and development of medicinal plants, sources and classification of drugs. Routes of drugs administration, dosage forms. Drug distribution, pKa values. Mechanism of action of drugs, combined effect of drugs. Absorption -first –pass effect. Distribution, metabolism- Phase I, II reactions, action of cytochrome p450 & elimination of drug.

UNIT-II **(15 Hours)**

Adverse response to drugs, Drug tolerance, Drug intolerance, drug allergy. Tachyphylaxis, Drug abuse, vaccination against infection, factor that modifies the effect of drug. Assay of drug potency- bioassay and immunoassay. Drug interactions, factors affecting drug metabolism including stereo chemical aspects, significance of drug metabolism in medicinal chemistry.

UNIT- III **(15 Hours)**

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.

UNIT-IV

(15 Hours)

Mechanism of action of drugs used in therapy of: Respiratory system – cough, bronchial – asthma,pulmonary tuberculosis. GIT – Digestants, appetite suppressants. Hypolipidemia agents, vomiting, constipation and peptic ulcer. Antimicrobial drugs – sulfonamides, trimethoprim, cotrimoxazole, penicillin, and macrolides. Aminoglycosides, Cephalosporin and bacterial resistance. Insulin and oral diabetic drugs, antifertility and ovulation inducingdrugs.

UNIT-V **(15 Hours)**

Drugs of plant origin: Drug dependence and abuse – Management of self poisoning cancer. Chemotherapy – Cytotoxic drug. Immuno suppressive drug therapy. CADD New Biological Targets forDrug Development. Novel Drug Screening Strategies

TEXT BOOKS

1. Willam.O.Foye, (1995) **Principles of Medicinal Chemistry** 4th Edition Waverks Pvt. Ltd. New Delhi

2. R.S.Satoskar. S.D.Bhandhakar **Pharmacology and Pharmacotherapeutics**-Popular Prakashar Bombay.

3. Katzung Basic and **Clinical Pharmacology** 7th Edition – Katzung, Printice Hall, New Delhi

4.Goodman And Gillman **The Pharmacology** Vol I and II- Mc Graw Hill

REFERENCE BOOKS

1. Burger's **Medicinal Chemistry and Drug Discovery**: principles and practice – Wolf, John Wiley

2. Glick, Pasternak, (2002) **Molecular Biotechnology** 2nd Edition ak, Panima Publishers,

3. Davies,**Molecular Basis of Inherited Diseases** s, Read, IRL Press

4. Rang, Tale **Pharmacology** 3rd Edition

5. Goodman And Gillman,.**The Pharmacology** Vol I and II, Mc Graw Hill

WEB REFERENCE

1. www.fda.gov/Drugs/DevelopmentApprovalProcess/.../ucm071667.htm
2. www.ebi.ac.uk/interpro/potm/2006_10/Page1.htm
3. *minf.vub.ac.be/~fabi/edu/3degraad/HIV/cytochrome.html*
4. www.webmd.com/allergies/allergies-medications
5. *www.fda.gov/downloads/Drugs/.../DrugInnovation/UCM430299.pdf*

Semester: III	**Core Paper : XIII**
Paper Code: 14P3BC11	**Total Number of Hours :75**
Credit : 04	**5Hours/ Week**

GENETIC ENGINEERING AND MICROBIAL BIOCHEMISTRY

Objectives

On successful completion of the course the student should have Understood the basics, vectors, methods of gene cloning. Techniques and application of gene technology Bioprocess technology – fermentation methods and production of important compounds by using fermentation technology

UNIT-I **(15 Hours)**

Introduction to Gene clothing: Early development of Genetics – Gene cloning – Specialized tools and techniques – importance of gene cloning
Intellectual property rights and types, Patening, Isolation and Purification of DNA; Preparation of total cell DNA, Bacteriophage DNA, Plant cell DNA.

UNIT-II **(15 Hours)**

Cloning and Expression Vectors :Plasmids- Bacteriophage (M13 and λ) PUC vectors yeast vectors, agrobacterium, mediated gene transfer, YAC, BAC, Human artificial chromosomes, Ti plasmid, SV40, baculoviruses, adenoviruses, Papilloma viruses and retrovirus.

UNIT-III **(15 Hours)**

Multipulation of purified DNA: DNA manipulative enzymes – Nucleases, Ligases, Polymerases, Topoisomerases, Restriction enzymes performing restriction digests, Ligation – joining DNA molecules together – Random labelling Nick translation and End filling.

UNIT-IV

(15 Hours)

Bioprocess technology – Screening for industrially important microbes, Strain improvement for better yield; design of Fermentor – parts of the fermenter and their functions; types of fermentation Bioreactors –Solid substrate fermentation and media formulation. Inocula preparation; Recovery and purification of products; monitoring of Downstream processing.

UNIT-V

(15 Hours)

Animal cell and tissue culture: History and Scope – advantages and disadvantages, laboratory facilities, the substrate, culture media.
Primary culture, Cell lines, maintenance of cultures and cell lines; valuable products from animal cell lines. Tissue culture – slide, flask and test tube cultures

TEXT BOOKS

1. Glick, B.R. and Pasternak, (2010) .**Molecular Biotechnology** 4th Edition Pasternak, J.J. ASM Press,USA

2 Sambrook, J. Molecular cloning. (2001). **A Laboratory Manual** 3rd Edition , USA

3 Watson, W.H.Freeman(1992).**Recombianant DNA** 2nd Edition.Freeman and Co., NY

4. Alberts,Johnson,(2002). **Molecular Biology of the Cell** 4th Edition Alberts,Johnson, Lewis, Raff, Roberts and Walter,Garland pub., NY

5 Lodish H Baltimore (2008). **Molecular Cell Biology** .6th Edition et al., .Freeman and Co., NY

6. U.Sathayanarayana (2008).**Biotechnology** Books and Allied (p)Ltd., India .

REFERENCE BOOKS

1. Marx, J.L., (1989). **A Revolution in Biotechnology**, Cambridge Univ. press, UK

2. Smith, (1996). **Biotechnology** 3rd Edition. Smith, Cambridge Univ. press

3. Principles of **Gene Manipulation and Genomics** 7th Edition. Blackwell pub., NY

WEB REFERENCES

1. www.freepik.com/popular-**vectors**
2. www.nature.com/scitable/definition/**plasmid-plasmids**-28
3. www.cdc.gov/**adenovirus**/
4. www.thefreedictionary.com/**fermentation**
5. www.atcc.org/Products/**Cells**_and_Microorganisms/**Cell_Lines**.aspx
6. *https://www.thermofisher.com/so/en/home/.../gibco-**cell**.../**cell-lines**.html*

Semester: III **Core Pratical-III**
Paper Code: 14P3BCP03 **Total Number of Hours :45**
Credit : 04 **5Hours/ Week**

A. COLLECTION AND ANALYSIS OF BLOOD

1. Collection of venous blood
2. Estimation of blood glucose by o-Toluidine method.
3. Estimation of serum proteins by Lowry and Biuret Method.
4. Estimation of A.G. ratio in serum. Biuret Method.
5. Estimation of blood urea by DAM method.
6. Estimation of serum uric acid by Phosphotungstate Method.
7. Estimation of serum creatinine by Alkaline Picrate Method.
8. Estimation of serum cholesterol by Zlatkis, Zak and Boyle method.
9. Estimation of serum bilirubin by Evelyn Malloy method.

B. URINE ANALYSIS

1. Qualitative analysis of normal and pathological constituents in urine.
2 .Estimation of urea in Urine by DAM method.
3. Estimation of Creatinine in urine by Alkaline Picrate Method
4. Estimation uric acid in Urineby Phosphotungstate Method.
5. Estimation of Calcium in urine by Clark Method
6. Estimation of Chloride in urine by Schales &Schales Method

REFERENCES

1.David, T. Plummer, (1988). **An Introduction to Practical Biochemistry**. 3rd Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.

2. Pattabiraman, T.N. (1998). **Laboratory Manual in Biochemistry**. 3rd Edition. All India Publishers and Distributors. Chennai.

3. Jayaraman, S. (2003). **Laboratory Mannual in Biochemistry**.2nd Edition. New Age International (P) Limited. New Delhi

4. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2nd Edition. New Age International (P) Limited. New Delhi.

Semester: IV	**Elective-III**
Paper Code: 14P3BCE03	**Total Number of Hours :75**
Credit : 05	**5Hours/ Week**

RESEARCH METHODOLOGY

Objectives: To understand some basic concepts of research and its methodologies and identify appropriate research topics. Select and define appropriate research problem and parameters and prepare a project proposal.

(15 Hours)

UNIT- I : SCIENTIFIC RESEARCH & WRITING

Importance and need for research. Ethics and scientific research. Formulation of hypothesis. Types and characteristic designing a research work. Scientific writing - Characteristics - Logical format for writing thesis and papers. Essential features of abstract, introduction, review of literature, materials and methods, and discussion. Effective illustration - tables and figures. Reference styles - Harvard and Vancouver systems.

UNIT-II : BIOSTATISTICS (15 Hours)

Collection and classification of data - diagrammatic and graphic representation of datameasurementof central tendency - standard deviation - normal distribution - test of significance based on large samples - small samples - Student t test -correlation and regression - Chi square test for independence of attributes - ANOVA.

UNIT- III: BIOINFORMATICS (15 Hours)

Introduction to bioinformatics, scope of bioinformatics, role of computers in biology Th internet. The World Wide Web. Useful search engines - Boolean searching, search engine algorithms. Fineding scientific articles - PubMed.

UNIT-IV : DATABASES (15 Hours)

Data base concepts - database, database system, database management systems - hierarchical , rational and network, database security. Biological databases - types, sequence and structure. Data submission and data retrieval. Searching sequence databases - sequence similarity searches, amino acid substitution matrices. Database search - FASTA and BLAST, CLUSTAL

UNIT-V : BIOETHICS AND PATENTING (15 Hours)

Declaration of Bologina. Ethics in animal experimentation. CPCSEA guidelines - Animal careand technical personnel environment, animal husbandry, feed, bedding, water, sanitationand cleanliness, waste disposal, anesthesia and euthanasia. Composition of (Human) institutional Ethical Committee (IEC) - General ethical issues. Specific principles for chemical evaluation of drugs, herbal remedies and human genetic research, Ethics in food and drug safety. Environmental release of microorganisms and genetically engineered organisms Ethical issues in human gene therapy and human cloning.

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TEXT BOOKS

1. R.A. Day **How to Write a Scientific Paper**. Cambridge University Press.

.

2. Alley, Michael (1987).**The Craft of Scientific Writing**. Englewood Cliffs. N.N. Prentice

3. M.C. Sharma (1997). Desk Top Publishing on PC, BPB Publications,

4. Lesk (2002) A.M. **Introduction to Bioinformatics** Oxford.

5. Bergeron BP (2002) **Bioinformatics Computing** 1st Edition, Printice Hall

6. S.P. Gupta - **Fundamentals of Statistics**, Sultan Chand.

REFERENCE BOOKS

1. **Ethics and the use of Alternatives to Animals in Research and Education**, ShiraneePereira, CPCSEA.

2. CPCSEA **Guidelines for Laboratory Animal Facility** (CPCSEA) - No.13 Seaward road, Valmiki Nagar, Chennai-41

3. **Ethical Guidelines for Biomedical Research on Human Subjects (**2000). ICMR, New Delhi.

4. Dickson (1999). **Molecular and Cell biology of Human Gene Therapeutics**. Series Chapman andHall

WEB REFERENCEES

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2. www.wipo.int/wipo_magazine/en/2006/04/article_0003.html
3. www.ijme.in/182ar82.html
4. https://en.wikipedia.org/wiki/Database
5. *www.tutorialspoint.com/database_tutorials.htm*

Semester: IV	**Core Pratical-IV**
Paper Code: 14P3BCP04	**Total Number of Hours :45**
Credit : 04	**5Hours/ Week**

IMMUNOLOGICAL AND MOLECULAR BIOLOGY TECHNIQUES

1. Grouping of blood and Rh typing.
2. Latex agglutination test for rheumatoid factor and pregnancy.
3. ELISA - demonstration.
4. Extraction of genomic DNA
5 Immunoelectrophorsis Rocket Electrophoresis
6. Restriction digestion of DNA
7. Isolation of plasmid DNA
8. Preparation of competent cell -Transformation
9. Agarose Gel electrophoresis
10. Southern Blotting –Demonstration
11. PCR – Demonstration

REFERENCES

1.David, T. Plummer, (1988). **An Introduction to Practical Biochemistry**. 3rd Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.

2. Pattabiraman, T.N. (1998). **Laboratory Manual in Biochemistry**. 3rd Edition. All India Publishers and Distributors. Chennai.

3. Jayaraman, S. (2003). **Laboratory Mannual in Biochemistry**.2nd Edition. New Age International (P) Limited. New Delhi

4. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2nd Edition. New Age International (P) Limited. New Delhi.

5. S.Harisha (2007). **Biotechnology Procedures and Experiments Hand Book** Infinity Science press lakshmi publication private limited New Delhi.

Semester: IV **Elective-II**
Paper Code: 14P4BCE02 **Total Number of Hours :75**
Credit : 05 **5Hours/ Week**

BIOINFORMATICS & NANOTECHNOLOGY

Objectives: Analysis of gene and protein sequences to reveal protein evolution and alternative splicing, the development of computational approaches to study and predict protein structure to further understanding of function, the analysis of mass spectrometry data to understand the connection between phosphorylation and cancer, the development of computational methods to utilize expression data to reverse engineer gene networks in order to more completely model cellular biology, and the study of population genetics and its connection to human disease.

UNIT I – Database searches and sequence alignment (15 Hours)

Searching sequence database sequence similarity searches, amino acid substituation matrices, Database searchers: FASTA and BLAST, sequence filters, Iterative database searches and PSIBLAST. Multiple sequence alignment – gene and protein families.

UNIT II – Applications (15 Hours)

Prediction and visualization of protein structure. Drug discovery and development, combinatiorial chemistry and docking. Pharmacogenomics. Pharmacogenetics. Toxicogenenomics. Functional genomics, metabolomics. E-cell.

UNIT III – Metabolomics (15 Hours)

Metabolic pathways- Kegg and Wit, primer design, Microfluidics. Nanotechnology. Phylogenetics- building phylogenetic trees, Evolution of macromolecular sequences, Sequence annotation.

UNIT IV–Intrduction and definition of Nano technology **(15 Hours)**

Introduction, Definition and length scales, Importance of Nanoscale and technology, History of Nanotechnology, future of Nanotechnology: Nanotechnology Revolution, Applications of Technolog**y.**

UNIT V – Nano-stuctured materials: (15 Hours)

Fullerences – properties and Characteristics. Carbon Nanotubes – Characteristics and Applications. Quantum Dots and Wires. Gold Nanoparticles. Nanopores. Applications of NanoMoleculesinBiosystems.

TEXT BOOKS

1. Functional and computational Aspects **Genomic and proteomics** – sandarsunai

Bioinformatics-concepts,Skill and Application-S,C Rastogi ,Namitamendritta,Paragrastogi (2000).

2. **Protein Biochemistry and Proteomics**(2006).Hubert Rehn, Acadamic press

3. Harshawaedhan .P.Bal **Bioinformatics** Principles and Application

4. JanuszM.Bujnicki (2008) **Pratical Bioinformatics** Springer Berlin

REFERENCE BOOK

1. RohitMajumdar **Nanotechnology –**Basic science and Emerging Technologies

2. Nanotechnology –**Fundamentals and Application** –MansiKarKare

3. Nanoscience and technology-K.P.Mathar.

4. MountDavit. **Bioinformatics sequence and genome analysis** 2nd Edition

5. Liebler,Humana(2002) **Introduction to proteomics**:Tools for new biologyLiebler,Humana W.CBS pub.,

6. S.pennington (2002)**Proteomics**:Fromprotin sequence to function

7. Bryan Bergeron(2003)**Bioinformatics computing**

8. **Metabolomics** –Royston Goodacre

WEB REFERENCE

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2. *https://gmwgroup.harvard.edu/pubs/pdf/936.pdf*
3. www.crnano.org/whatis.html
4. www.metabolomicdiscoveries.com/
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M.Sc., BIOCHEMISTRY

QUESTION PAPER PATTERN

MAXIMUM MARKS – 75 marks

DURATION – 3 hours

PART –A (5 X 5 = 25 marks)

1. Either or Type
2. From each unit two questions

PART –B (5 X 10 = 50 marks)

1. Either or Type
2. From each unit two questions

14P1BC01

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
BIOPOLYMERS

I M.Sc., BIOCHEMISTRY - I Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

I.Answer all questions

1. (a)Discuss about the Polysacharides? (or)
   (b)What are Proteoglycans? Explain.
2. (a)Classify the Protein with examples.(or)
   (b)Explain about the Ramachandran Plot?
3. (a)What are sterols? Explain about plant sterols.(or)
   (b)Classify the Lipoproteins and explain its composition.(or)
4. (a)Write the structures of nucleotides?(or)
   (b)Describe the DNA histone proteins?
5. (a)Explain about nucleic acid binding proteins?(or)
   (b)Write the biological properties of vitamins .

PART-B (5X10=50)

II. Answer the following questions

6. (a)Discuss briefly about bacterial cell wall polysaccharides? (or)
   (b)Give a brief account on glycoprotein's and their biological importance?
7. (a)Explain about amino acid sequencing ? (or)
   (b)Write the structure and function of Hb, actin and myosin?
8. (a)Explain the transport and hydrolysis of triglycerol ? (or)
   (b)Describe the membrane of cell organelles and membrane transport?
9. (a)Discuss the structure of nitrogenous bases? (or)
   (b)Explain the major class of RNA?
10. (a)Write the techniques characterizing nucleic acid and protein complex? (or)
    (b)Explain the structure, requirement, deficiency and anti oxidant properties of water soluble vitamins?

14P1BC02

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN (AUTONOMOUS)

CELLULAR BIOCHEMISTRY

I M.Sc., BIOCHEMISTRY - I Semester

Time: 3 Hrs **Maximum Marks:75**

PART A (5X5=25)

I.Answer all questions

1. (a)Discuss about the cell divison? (or)
   (b)Write note on phases of cell cycle?
2. (a) Explain about actin filament? (or)
   (b)Explain the morphology of mitochondria?
3. (a)Write the overview of cell-cell interaction? (or)
   (b)Explain about cadherins.
4. (a)Write about molecular diagnosis of cancer?(or)
   (b)Explain the tumour repressor genes
5. (a)Explain the bacteriorpdophsin. (or)
   (b)Describe symporters with example?

PART-B (5X10=50)

II. Answer the following questions

6. (a)Explain in brief about the membrane proteins and its types? (or)
   (b)Discuss about RBC ghosts and solubilisation of proteins.
7. (a) Explain the morphology and functions of chloroplast and peroxisosomes (or)
   (b)What is protein sorting and transport? Explain.
8. (a)Explain about signaling molecules and their receptors? (or)
   (b) Describe in brief about Cell-Cell adhesion.
9. (a)Explain the tumour virus.(or)
   (b)Explain the properties of tumour cells.
10. (a)Discuss the transport of glucose in to the membrane.(or)
    (b)Write in detail about membrane proteins.

14P1BC03

(For the candidates admitted from 2014 0nwards)
VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)

ENZYMES AND ENZYME TECHNOLOGY

I M.Sc., BIOCHEMISTRY - I Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

I.Answer all questions

1. (a)Write the factors affecting enzyme activity? (or)
   (b)Explain the types of Isoenzymes.
2. (a)What is acid-base catalysis? (or)
   (b)Explain about metal activated enzymes.
3. (a)What are allosteric enzymes? (or)
   (b)Define LB plot.
4. (a)Write the applications of MCA's? (or)
   (b)What are anticoagulants?
5. (a)Discuss about the enzymes as thrombolytic agents? (or)
   (b)Write the uses of enzymes in Pharmaceutical industries?

PART-B (5X10=50)

II. Answer the following questions

6. (a)Explain the classification of enzymes with examples.(or)
   (b)Discuss about the enzyme modification by site directed mutagenesis.
7. (a)Write the mechanism of reaction catalysed by lysozyme and chymotrypsin. (or)
   (b)Discuss the coenzymes and cofactors in enzyme catalysed reaction.
8. (a)Describe the bisubstrate reaction. (or)
   (b)Explain the types of inhibitors.
9. (a)What are biosensors? Explain its types. (or)
   (b)Explain the techniques and applications of immobilized enzyme.
10. (a)Describe the enzymes as analytical reagents? (or)
    (b)Explain the enzymes in medicine and industry.

14P1BC04

(For the candidates admitted from 2014 0nwards)
VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
ANALYTICAL BIOCHEMISTRY

I M.Sc., BIOCHEMISTRY - I Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

I.Answer all questions

1. (a)Write the biochemical buffers?(or)
   (b)What are the uses of liquid nitrogen in cell distruption.
2. (a)Write the types of centrifuges and rotors? (or)
   (b)Explain about capillary electrophoresis.
3. (a)What is paper chromatography? Explain.(or)
   (b)Explain the principles of Affinity chromatography.
4. (a)Write the applications of UV-Visible spectrophotometer. (or)
   (b)Define ESR.
5. (a)Explain the principles and applications of CD? (or)
   (b)Discuss the units of radioactivity.

PART-B (5X10=50)

II. Answer the following questions

6. (a)Explain briefly about oxygen electrode. (or)
   (b)Explain the different methods of cell distruption.
7. (a)Define analytical ultracentrifugation. (or)
   (b)What is isoelectric focusing? Explain
8. (a)Explain gas-liquid chromatography? (or)
   (b)Discuss in brief HPLC.
9. (a)Explain Mass spectrometry.(or)
   (b)Discuss the principles and applications of Flame photometry.
10. (a)Explain in detail about X-ray diffraction. (or)
    (b)What is autoradiography? Explain.

14P2BC05

(For the candidates admitted from 2014 onwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
INTERMEDIARY METABOLISM
I M.Sc., BIOCHEMISTRY - II Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

Answer all questions

1. a) Write a short notes on high energy phosphate (or)

   b) Describe malate-Asparatate shuttle system.

2. a)Glycolysis (or)

   b) Glyoxalate pathway

3. a) Explain alpha oxidation of Fattyacid (or)

   b) Write the synthesis of TAG and phosphatidyl choline

4. a)Explain transamination and decarboxylation (or)

   b)Describe the synthesis of epinephrine and nor epinephrine

5. a)Write a notes on biosynthesis of Hb (or)

   b)Write about the regulation of pyrimidine biosynthesis

PART- B (5X10=50)

Answer all questions

6.a) Write a short notes on oxidative phosphorylation (or)

   b)Explain uncouplers of oxidative phosphorylation

7.a)TCA cycle and its regulation (or)

   b)Write about metabolism of fructose, galactose and mannose

8.a)Write about beta oxidation of palmitic acid and calculate the energitics (or)

   b) Biosynthesis of prostoglandin

9.a)Describe Urea cycle and its regulation (or *)*

   b)Biosynthesis of Creatinine and creatine

10 a)Describe about denovo synthesis of purines (or)

   b)Write about pyrimidine biosynthesis

14P2BC06

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
MOLECULAR BIOLOGY
I M.Sc., BIOCHEMISTRY - II Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

Answer all questions

1. a)Write a short notes on Messelson and stahl experiment (or)

   b) Describe about retrovirus.

2. a) Explain the mechanism of Group I splicing (or)

   b) Write about inhibition of transcription

3. a) Explain Wobble hypothesis (or)

   bWrite about activation and initiation of protein synthesis.

4. a)Explain about glycosylation process in protein tagetting (or)

   b)Describe Lac operon.

5. a)Write a notes on DNA damage (or)

   b)Write about the nucleotide excision repair.

PART -B (5X10=50)

Answer all questions

6.a) Explain the mechanism of replication in prokaryotes (or)

   b)Explain about reverse transcriptase.

7.a) Write a short on Ribozymes (or)

   b)Write about mechanism of 5' capping and poly A tail.

8.a)Write about genetic feature of genetic code (or)

   b) Write about post translational modification of proteins.

9.a)Describe Trp operon *(*or *)*

   b)Explain gene amplification.

10 a)Describe about SOS repair system (or)

   b)Write about mismatched repair system

14P2BC07

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN (AUTONOMOUS)

ADVANCED ENDOCRINOLOGY AND NEUROPHYSIOLOGY

I M.Sc., BIOCHEMISTRY - II Semester

Time: 3 Hrs **Maximum Marks:75**

PART- A (5X5=25)

Answer all questions

1.a)Discuss cAMP as second messenger (or)

b) Explain mechanism of action of steroid hormone

2.a)Draw a structure of pituitary gland (or)

bWrite a note on oxytocin and vasopressin

3.a) Describe the physiological role of parathyroid hormone (or)

b)Describe about pathophysiology of parathyroid hormone

4.a)Write the structure and physiological role of insulin (or)

b)Write about endorphins

5.a)Write a short notes on androgen (or)

b) Describe about steroid ovarian hormones

PART- B (5X10=50)

Answer all questions

6.a)Give an account of neuroendocrine integration in homeostasis (or)

b)Explain the mechanism of action of second messenger

7.a) Write a short notes on hypothalamic hormone (or)

b) Explain mechanism of action of cacium homeostasis

8.a) Write in detail about Thyroid hormones (or)

b) Write a short notes on MSH melatonin

9.a) Write in detail about glucagon and somatostatin (or)

b) Write a short notes on neurohormone

10.a) Write a short notes on androgen (or)

b) Write about human infertility

14P2BCE01

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

I M.Sc., BIOCHEMISTRY - II Semester

Time: 3 Hrs **Maximum Marks:75**

PART -A (5X5=25)

Answer all questions

1.a)Photosynthetic apparatus (or)

b)Write a note on photosystem

2.a)Hatch-Slack pathway (or)

b)Write a note on starch biosynthesis

3.a) Describe the biochemistry of nitrogen fixation (or)

b) Explain the interaction between nitrate assimilation and carbon metabolism

4.a) Write about organization of plant chromatin (or)

b) List out the advantages and uses of transgenic plants

5.a) Write a short notes on media preparation (or)

b) Write the uses of haploids in plant breeding

PART- B (5X10=50)

Answer all questions

6.a) Write in detail about photosynthetic pigment (or)

b)Explain the mechanism of cyclic and non cyclic photophosphorylation

7.a) Write a short notes on photorespiration (or)

b) Explain Calvin cycle

8.a) Explain the mechanism of symbiotic nitrogen fixation in legumes (or)

b) Write about synthesis and functions of glutathione and its derivatives

9.a) Write in detail about development of chloroplast (or)

b) Write a short notes on protoplast transformation

10.a) Write a short notes somoclonal variation (or)

b)List out uses of plant tissue culture

14P3BC08

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
ADVANCED CLINICAL BIOCHEMISTRY

I MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A (5X5=25)**

1. a) Write about Amniotic fiuids (Or)
   b) Discuss about automation in clinical laboratory.

2. a) Explain about Insulin receptor (Or)
   b) Write about disorders of cholesterol metabolism.

3. a) Write an note on alkaptonuria (Or)
   b) Explain Gout.

4. a)Write about Dialysis (Or)
   b)Discuss about Cerebrospinal fluid.

5. a)Write about hemoglobinopathies (Or)
   b) Classify Anemia.

PART-B (5X10=50)

II. Answer the following questions

6. (a) Discuss briefly about collection of specimens? (Or)
   (b) Give a brief account on laboratory safety ?

7. (a) Explain about diabetes mellitus ? (Or)
   (b) Discuss about glycogen storage disease?

8. (a) Explain about inborn error of branched chain amino acids ? (Or)
   (b) Describe briefly about disorders of nucleic acid metabolism?

9. (a) Discuss about renal function test? (Or)
   (b) Explain about liver function test?

10. (a) Write about disorder of erythrocyte metabolism? (Or)
    (b) Explain about bold clotting

14P3BC11

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
GENETIC ENGINEERING AND MICROBIAL BIOCHEMISTRY
I MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1. a) Define gene & its function (Or)
   b)Explain Gene cloning Techniques

2. a)Write about vector and its types (Or)
   b) Explain Restriction enzymes.

3) a) Write about Plasmid DNA (Or)
   b) Write short note on Papilloma viruses

4) a)Explain fermentation process (Or)
   b) How to screened fermentation process.

5. a)Advantages & disadvantages of cell culture (Or)
   b) Write short note on prepare the culture medium.

PART-B **(5X10=50)**

II. Answer the following questions

6. (a) How to developed the gene & its importance (Or)
   (b) Explain about Isolation & purification of DNA

7. (a) Explain the human artificial chromosome (Or)
   (b) Write about plasmid DNA & its types

8. (a) Write notes on DNA manipulating enzymes (Or)
   (b) How to perform the restriction enzyme in cloning process

9. (a) Explain the design of fermentor and its function(Or)
   (b) Describe the Down stream processing technique.

10. (a) Write a essay on embryo culture method (Or)
    (b) Explain about Isolation & purification of stem cells.

14P4BCE02

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
BIOINFORMATICS AND NANOTECHNOLOGY
II MSC (BIOCHEMISTRY)-IV Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1.a) Write about the Bioinformatics (or)
b) Explain about FASTA formet

2.a) Write about the Bioinformatics (or)
b)Explain about FASTA formet

3.a)How to search the sequences (or)
b)How to do the substitude Matrix

4.a)Define Nanotechnology & Length scales (or)
b)Write short on applications of Nanotechnology

5.a) Short note on florescence ` (or)
b) Write about Carbon Nano tubes

PART-B (5X10=50)

II. Answer the following questions

6. (a)Explain the Multiple Sequence alignment (Or)
(b) Descibe Topology of Computer

7. (a)Briefly explain the Bioinfomatics tool (Or)
(b) Explain Phylogenetic analysi

8. (a)Describe the drug discovery & development (Or)
(b) Evalution of Macromolecule sequences

9. (a) Explain the history of Nanotechnology (Or)
(b) Advance development of Nanotechnology

10. (a) Explain Gold Nanoparticles (Or)
(b) Describes Nano particles in Biosystem

14P3BC11

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
BIOINFORMATICS AND NANOTECHNOLOGY
II MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

GENETIC ENGINEERING AND MICROBIAL BIOCHEMISTRY

I. Answer all questions **PART A** **(5X5=25)**

1. Define gene & its function (or)
   Explain Gene cloning Techniques.

2. Write about vector and its types (or)
   Explain Restriction enzymes.

3. Write about Plasmid DNA (or)
   Write short note on Papilloma viruses.

4. Explain fermentation process (or)
   How to screened fermentation process.

5. Advantages & disadvantages of cell culture (or)
   How to prepare the culture medium.

SECTION-B

II. Write any five questions **(5×10=50)**

6. How to developed the gene & its importance (or)
   Explain about Isolation & purification of DNA

7. Write about plasmid DNA & its types (or)
   Explain human artificial chromosome

8. Write about DNA manipulating enzymes (or)
   How to perform the restriction enzyme in cloning process.

9. Explain design of fermentor& function (or)
   Descripe about Down stream processing technique.

10. How to develop embryo culture method (or)
    Explain about Isolation & purification of stem cells.

14P3BC09

(For the candidates admitted from 2014 0nwards)
VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)

IMMUNOLOGY
II MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1. a) Define hematopoisis? (Or)
   b)Explain about immune reactive cells.

2. a)Write about the antigen recognition. (Or)
   b) Explain in brief about cytokines.

3) a) Write about the vaccine toxoids. (Or)
   b) Write short note on autoimmune disorders.

4) a)Explain about T cell deficiencies. (Or)
   b) Give an account on AIDS vaccines..

5. a) Write about Nephlometry. (Or)
   b) Write short note on tumor antigens.

PART-B **(5X10=50)**

II. Answer the following questions

6. (a) Explain in detail about types of lymphoid organs. (Or)
   (b) Explain about the mechanism of immunity to infection.

7. (a) Explain about the theories of antibody formation. (Or)
   (b) Write about the types of MHC molecules.

8. (a) Write a short notes on hypersensitivity types I and II (Or)
   (b) Give an account on hybridoma technology.

9. (a) Write in detail about B cell and T cell deficiencies. (Or)
   (b) Give a short note on Transplantation immunology.

10. (a) Write an essay about Macrophage culture and assay of macrophage activation
   (Or)
   (b) Explain about the purificarion and quantification of antibody.

14P3BC09

(For the candidates admitted from 2014 0nwards)
VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
IMMUNOLOGY

II MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1. a) Define hematopoisis? (Or)
   b)Explain about immune reactive cells.

2. a)Write about the antigen recognition. (Or)
   b) Explain in brief about cytokines.

3) a) Write about the vaccine toxoids. (Or)
   b) Write short note on autoimmune disorders.

4) a)Explain about T cell deficiencies. (Or)
   b) Give an account on AIDS vaccines..

5. a) Write about Nephlometry. (Or)
   b) Write short note on tumor antigens.

PART-B **(5X10=50)**

II. Answer the following questions

6. (a) Explain in detail about types of lymphoid organs. (Or)
   (b) Explain about the mechanism of immunity to infection.

7. (a) Explain about the theories of antibody formation. (Or)
   (b) Write about the types of MHC molecules.

8. (a) Write a short notes on hypersensitivity types I and II (Or)
   (b) Give an account on hybridoma technology.

9. (a) Write in detail about B cell and T cell deficiencies. (Or)
   (b) Give a short note on Transplantation immunology.

10. (a) Write an essay about Macrophage culture and assay of macrophage activation
   (Or)
   (b) Explain about the purificarion and quantification of antibody.

14P3BC10

(For the candidates admitted from 2014 0nwards)

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
DRUG BIOCHEMISTRY

II MSC (BIOCHEMISTRY)-III Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1. a) Describe about drug distribution? (Or)
   b)Explain about the action of cytochrome p450.

2. a)Write about drug intolerance. (Or)
   b) Write the factors affecting drug metabolism.

3) a) Write about the autocoids. (Or)
   b) Write short note on therapeutic gases.

4) a)Explain about constipation peptic ulcer. (Or)
   b) Give an account on ovulation inducing drugs.

5. a) Write about immuno suppressive drug theraphy. (Or)
   b) Write short note on novel drug screening strategies.

PART-B **(5X10=50)**

II. Answer the following questions

6. (a) Explain in detail about classification and routes of drug administration. (Or)

   (b) Explain about the metabolism of drug.

7. (a) Explain about the adverse response to drugs. (Or)
   (b) Write about the bioassay and immune assay.

8. (a) Write a short notes on action of drugs on CNS. (Or)
   (b) Give an account on gene theraphy.

9. (a) Write in detail about sulphonamides and penicillin. (Or)
   (b) Give a short note on insulin and oral diabetic drug.

10. (a) Write an essay about drug dependence and abuse. (Or)
    (b) Explain about the chemotherapy.

(For the candidates admitted from 2014 0nwards) **14P3BCE03**

VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
RESEARCH METHODOLOGY

II MSC (BIOCHEMISTRY)-IV Semester

Time: 3 Hrs **Maximum marks: 75**

I. Answer all questions **PART A** **(5X5=25)**

1. a) Describe about Ethics and scientific research (Or)
   b) Explain about the review of literature

2. a)Write about Student t test correlation (Or)
   b) Write about the standard deviation

3) a)Write about thescope of bioinformatics (Or)
   b)Write short note on role of computers in biology

4) a)Explain about database system (Or)
   b)Give an account on CLUSTAL

5. a) Write about Ethics in food and drug safety (Or)
   b) Write a short note on gene therapy.

PART-B **(5X10=50)**

II. Answer the following questions

6. (a) Explain in detail about Formulation of hypothesis. (Or)
   (b) Explain about the Logical format for writing thesis and papers

7. (a)Explain about the Chi square test for independence of attributes (Or)
   (b)Write in detail about ANOVA

8. (a) Write a short notes on PubMed.(Or)
   (b) Give an account on The World Wide Web

9. (a)Write in detail about FASTA and BLAST (Or)
   (b)Give a short note on Data submission and data retrieval

10. (a)Write an essay about Ethics in animal experimentation. (Or)
    (b)Explain about the institutional Ethical Committee (IEC)