

## REGULATIONS

### I. SCOPE OF THE COURSE

The M.Sc., programme of two years in Vivekanandha 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

- 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 could have a Bachelors Degree in Science with Biochemistry, Chemistry, Botany, Zoology, Nutrition and dietetics 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. ASSESSMENT**

- Assessment of the students would be made through Continuous Internal Assessment (CIA) and External Assessment (EA) for passing each subject both theory and practical papers. A candidate would be permitted to appear for the External 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.

**A. CONTINUOUS INTERNAL ASSESSMENT (CIA)**

The performance of the students will be assessed continuously by the teacher concern and the Internal Assessment Marks will be as follows:

**Distribution Of Continuous Assessment Marks (25/40)**

Activity	Period (WD)	Marks (25)	Activity	Marks (40)
Attendance	90	5	Attendance	5
CA Test I	30 to 35	2.5	CA Test I/Review	5
CA Test II	60 to 65	2.5	CA Test II/Review II	5
Model	After 90	10	Model/Model Presentation	10
Assignment	15 to 20	1	Observation note	10
Poster	30 to 35	1	Results in lab/Work	5
PowerPoint	45 to 50	1		
Skit	60 to 65	1		
Group discussion	65 to 70	1		
<b>Total</b>		<b>25</b>		<b>40</b>

**Distribution of attendance mark**

S. No.	Percentage	Marks	
		Theory	Practical
1	76-80	1	2
2	81-85	2	4
3	86-90	3	6
4	91-95	4	8
5	96-100	5	10

**A. EXTERNAL ASSESSMENT (EA)**

The performance of the students would be assessed by examination at the end of each semester with a written test for theory for three hours and practical examination at the end of even semesters for six hours. Question papers would be set by the selected external examiners in the prescribed format and valuated by the external examiners with the help of the teacher concern.

The pattern of assessment is as follows:

### **Distribution Of Final Assessment Marks (75/60)**

Section	Activity	Marks (75)	Activity	Marks (60)
A	Five marks (5) (Either or)	25	Record work	5
B	Ten marks (10) (Either or)	50	Viva Voce	5
			Spotter	20
			Experiment I	15
			Experiment II	15
<b>Total</b>		<b>75</b>	<b>Total</b>	<b>60</b>

## **VII. PASSING MINIMUM**

### **INTERNAL**

There is no passing minimum for CIA

### **EXTERNAL**

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

## **VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

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

- 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.
- 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
- 50% and above but below 60% shall be declared to have passed the examinations in second class.
- All the remaining successful candidates shall be declared to have passed the examinations in third class.
- 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.

## **IX. ELIGIBILITY FOR AWARD OF THE DEGREE**

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 three academic years comprising of six semesters and passed the examinations prescribed and fulfilled such conditions has have been prescribed therefore.

#### **X. PROCEDURE IN THE EVENT OF FAILURE**

Candidates fail in any subject would be permitted to appear for each failed subject or subjects in the subsequent EA. However, final year students failed in one or two subjects would be allowed to appear for a supplementary exam within a month of the final result.

#### **XI. COMMENCEMENT OF THESE REGULATIONS**

These regulations shall take effect from the academic year 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

#### **XII. TRANSITORY PROVISIONS.**

Candidates who have undergone the PG Course of study before 2017-18 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., upto and inclusive of the examination of April/May 2019-2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

Supplementary examination will be conducted within a month. In case of failure she has to complete within 5 years. (3+5)

For the deserving candidates, if a student fails in a single subject she can be provided with 15 marks in the examination.

**XII. COURSE PATTERN**

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
SYLLABUS FRAME WORK**

Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks	Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks
<b>YEAR I</b>													
<b>Semester I</b>							<b>Semester II</b>						
Core Paper I	5	4	3	25	75	100	Core Paper V	5	4	3	25	75	100
Core Paper II	5	4	3	25	75	100	Core Paper VI	5	4	3	25	75	100
Core Paper III	5	4	3	25	75	100	Core Paper VII	5	4	3	25	75	100
Core Paper IV	5	4	3	25	75	100	Core Paper VIII	5	4	3	25	75	100
Elective I	5	4	3	25	75	100	Elective II	5	3	3	25	75	100
Practical – I	5	4	6	40	60	100	Practical – II	5	4	6	40	60	100
<b>Total</b>	<b>30</b>	<b>24</b>	<b>21</b>	<b>165</b>	<b>435</b>	<b>600</b>	<b>Total</b>	<b>30</b>	<b>23</b>	<b>21</b>	<b>165</b>	<b>435</b>	<b>600</b>
<b>I YEAR TOTAL</b>								<b>60</b>	<b>47</b>	<b>42</b>	<b>330</b>	<b>870</b>	<b>1200</b>
<b>YEAR II</b>													
<b>Semester III</b>							<b>Semester IV</b>						
Core Paper IX	5	4	3	25	75	100	Core Paper XII	5	5	3	25	75	100
Core Paper X	5	4	3	25	75	100	Core Paper XIII	5	4	3	25	75	100
Core Paper XI	5	4	3	25	75	100	Core Paper XIV	5	4	3	25	75	100
EDC	4	4	3	25	75	100	Project Work	15	4	6	40	60	100

Elective III	5	4	3	25	75	100							
Practical – III	5	4	6	40	60	100							
Internship Training Programme		2		40	60	100							
Human Rights	1	1	3	25	75	100							
<b>Total</b>	<b>30</b>	<b>27</b>	<b>24</b>	<b>230</b>	<b>570</b>	<b>800</b>	<b>Total</b>	<b>30</b>	<b>17</b>	<b>21</b>	<b>115</b>	<b>285</b>	<b>400</b>
<b>II YEAR TOTAL</b>								<b>60</b>	<b>44</b>	<b>45</b>	<b>345</b>	<b>855</b>	<b>1200</b>
<b>TOTAL CREDIT FOR THE COURSE</b>								<b>120</b>	<b>91</b>	<b>87</b>	<b>675</b>	<b>1725</b>	<b>2400</b>

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
DEPARTMENT OF BIOCHEMISTRY  
CBCS SYLLABUS - PG  
(For candidates admitted from 2017-2018 onwards)**

Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks	Subjects	Inst. Hour/Week	Credit	Exam Hours	Internal	External	Total Marks
<b>YEAR I</b>													
<b>Semester I</b>							<b>Semester II</b>						
Paper I - Biopolymers	5	4	3	25	75	100	Paper V – Intermediary Metabolism and Regulation	5	4	3	25	75	100
Paper II – Cellular Biochemistry	5	4	3	25	75	100	Paper VI – Molecular Biology	5	4	3	25	75	100
Paper III – Enzymology and Enzyme Technology	5	4	3	25	75	100	Paper VII – Endocrinology	5	4	3	25	75	100
Paper IV – Analytical Biochemistry	5	4	3	25	75	100	Paper VIII – Immunology and Immunotechnology	5	4	3	25	75	100
Elective I – Microbial Biochemistry	5	4	3	25	75	100	Elective II – Plant Biochemistry and Plant Biotechnology	5	3	3	25	75	100

Practical – I	5	4	6	40	60	100	Practical – II	5	4	6	40	60	100
<b>Total</b>	<b>30</b>	<b>24</b>	<b>21</b>	<b>165</b>	<b>435</b>	<b>600</b>	<b>Total</b>	<b>30</b>	<b>23</b>	<b>21</b>	<b>165</b>	<b>435</b>	<b>600</b>
<b>I YEAR TOTAL</b>							<b>60</b>	<b>47</b>	<b>42</b>	<b>330</b>	<b>870</b>	<b>1200</b>	
<b>YEAR II</b>													
<b>Semester III</b>							<b>Semester IV</b>						
Paper IX – Advanced Clinical Biochemistry	5	4	3	25	75	100	Paper XII – Neuroscience	5	5	3	25	75	100
Paper X – Drug Biochemistry	5	4	3	25	75	100	Paper XIII – Bioinformatics and Nanotechnology	5	4	3	25	75	100
Paper XI – Genetic Engineering and Fermentation Technology	5	4	3	25	75	100	Paper XIV – Human Physiology	5	4	3	25	75	100
EDC - Medical Laboratory Technology	4	4	3	25	75	100	Project Work	15	4	6	40	60	100
Elective III – Research Methodology	5	4	3	25	75	100							
Practical – III	5	4	6	40	60	100							
Internship Training Programme		2		40	60	100							
Human Rights	1	1	3	25	75	100							
<b>Total</b>	<b>30</b>	<b>27</b>	<b>24</b>	<b>230</b>	<b>570</b>	<b>800</b>	<b>Total</b>	<b>30</b>	<b>17</b>	<b>21</b>	<b>115</b>	<b>285</b>	<b>400</b>
<b>II YEAR TOTAL</b>							<b>60</b>	<b>44</b>	<b>45</b>	<b>345</b>	<b>855</b>	<b>1200</b>	



**YEAR I – SEMESTER I**  
**BIOPOLYMERS**

Paper	: Core I	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P1BC01	External	: 75

**SUBJECT DESCRIPTION:**

Biopolymers deal with the brief information on the structure, functions and behavioral properties of biomolecules.

**OBJECTIVES:**

The main objective of the course is to study about carbohydrates, proteins, lipids, and nucleic acids and their structure and properties in advanced level.

**OUTCOME:**

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

**CONTENT:**

**Unit I – (15 Hrs.): Carbohydrates:** Introduction, Classification, and Properties of carbohydrates, 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 Hrs.): Proteins and Amino Acids:** Classification, Structure, Function, Properties of Amino acids 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 Hrs.): Lipids:** Classification, Structure, Properties and Functions of lipids, Transport and hydrolysis of triglycerol, Plant and animal sterols, Fatty acids - Types and significance, Structure and functions of cholesterol, Lipid peroxidation and antioxidants, Lipoproteins-Classification and composition.

**Unit IV – (15 Hrs.): Nucleic Acids:** Structure and properties of nitrogenous bases and nucleotides, Cot value and Cot curve, Chemical synthesis of DNA, Major classes of RNA - Structure and biological functions of mRNA, rRNA, tRNA, snRNA, hnRNA, DNA histone proteins, chromatin, non-histone proteins, Methylated bases of DNA and DNA super coiling, Properties of DNA- buoyant density, viscosity, denaturation and renaturation.

**Unit V – (15 Hrs.): Molecular Aspects of Proteins:** DNA binding proteins - helix-turn-helix, zinc-finger motif, leucine zipper – direct interactions, Techniques for characterizing nucleic acid-protein complex- gel retardation assay. Disease related to protein folding – Alzheimer’s and mad cow disease, Protein denaturation.

#### TEXT BOOKS:

1. Bery J.M., Tymoezko J.L. and Stryer L. (2008) **Biochemistry**, 5<sup>th</sup> Edition, W.H. Freeman and Company, New York.
2. Deb, A.C (2004). **Fundamentals of Biochemistry**. 8<sup>th</sup> 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**. 5<sup>th</sup> Edition John Wiley and sons, Singapore.
5. U.Sathayanarayana,(2006). **Biochemistry**. 3<sup>rd</sup> 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**. 23<sup>rd</sup> Edition, Prentice Hall International Inc.,New Jersey.
2. Nelson, D.L. and Cox, M.M (2008). **Lehninger Principles of Biochemistry**. 5<sup>th</sup> 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** 4<sup>th</sup> Edition, The Macmillan Company, London.
4. Zubay, G. (1999). **Biochemistry**, 4<sup>th</sup> Edition, WCB. Mcgraw-Hill, New York.
5. Thomas,M. Devlin, A John Wiley,(1997).**Text book of Biochemistry**. 4th Edition, Inc Publication, New York.

**YEAR I – SEMESTER I  
CELLULAR BIOCHEMISTRY**

Paper	: Core II	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>17P1BC02</b>	External	: 75

**SUBJECT DESCRIPTION:**

Cellular Biochemistry deal with the brief information on the different tissue types, cellular organelles and its biochemistry.

**OBJECTIVES:**

The objective of the course is to understand the relationship between cellular organization and biological function of normal cell, prokaryotic and eukaryotic cells. To learn about various cell organelles with their functions and actions. To learn about the application of cellular biology in research.

**OUTCOME:**

Students would able to understand the basic relationship between cellular organization and its biological functions, about normal prokaryotic and eukaryotic cells and membrane architecture.

**CONTENT:**

**Unit I – (15 Hrs.): Cellular Organization:** Structure and functions of cells - prokaryotes and eukaryotes, Cell division - mitosis and meiosis, cell cycle - phases of cell cycle, and regulation of cell growth and cell cycle, molecular motors, micro tubular associated proteins - role in intracellular motility.

**Unit II – (15 Hrs.): 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 – (15 Hrs.): Cellular Interaction:** Cell-Cell interaction - Collagen, hyaluronan & proteoglycans, laminin, integrins and fibronectins, Cell-Cell adhesion - Specialised junctions, Desmosomes, Gap junctions, Adhesion molecules – Cadherins, Connexins. Cell-Cell 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 – (15 Hrs.): 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 – (15 Hrs.): Membrane Architecture and Functions:** Membrane bilayer - Models, Membrane lipids - fluidity, Asymmetry phase transition, Liposomes Membrane proteins - Types, Orientation, 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), 2<sup>nd</sup> Edition, **Cell and Molecular Biology**. New Age International Publishers, New York.
2. Geoffrey, M. Cooper and Robert E. Hausman, **The Cell: A Molecular Approach**. 4<sup>th</sup> Edition, Asm Press, USA.
3. Gerald Karp, (2008). **Cell and Molecular Biology**. 5<sup>th</sup> Edition, John Wiley and Sons New Jersey.
4. Ajay Paul, (2009). **Text Book of Cell and Molecular Biology**. 2<sup>th</sup> Edition, Books and Allied (P) Ltd, Kolkata.

#### REFERENCE BOOKS

1. Lodish, H. Baltimore, and *et al.*, (2008). **Molecular Cell Biology**. 6<sup>th</sup> 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

#### WEB SOURCES:

- <https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookCELL2.html>  
<https://www.physics.uoguelph.ca/~dutcher/download/.../1.pdf>  
<https://www.khanacademy.org/.../cells/cell-cell-interactions/.../cell-cell-interactions-ho...>  
[https://en.wikipedia.org/wiki/Programmed\\_cell\\_death](https://en.wikipedia.org/wiki/Programmed_cell_death)

**YEAR I – SEMESTER I**  
**ENZYMOLGY AND ENZYME TECHNOLOGY**

Paper	: Core III	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P1BC03	External	: 75

**SUBJECT DESCRIPTION:**

Enzymology and Enzyme Technology deal with the knowledge on enzymes, classification structure kinetics and applications.

**OBJECTIVES:**

To make the students acquire knowledge about techniques of isolation & purification of the enzymes, Kinetics of the enzymes and its application in medicine and industry.

**OUTCOME:**

On successful completion of the course the students would gain knowledge about Techniques of isolation & purification of the enzymes its kinetic studies in normal and inhibition stage, application.

**CONTENT:**

**Unit I – (15 Hrs.): Enzymes:** Introduction, Classification of enzymes by IUB system, Factors affecting enzyme activity, Active site – Definition, investigations of active site structure, Trapping ES complex, Enzyme modification by site directed mutagenesis, Isoenzymes (CK, LDH) and Multienzyme complex (PDH), abzymes, ribozymes.

**Unit II – (15 Hrs.): 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, carboxypeptidase, Coenzymes and cofactors in enzyme catalysed reaction (AT Case).

**Unit III – (15 Hrs.): Enzyme Kinetics:** MM Kinetics, LB plot, Eadie - Hofstee plot, Hanes-woolf plot and Hill plot, Bisubstrate reactions, Effect of pH, temperature, substrate and enzyme concentration on the rate of enzyme catalysed reaction, Enzyme inhibition and types, Allosteric inhibition and regulation, concerted and sequential models for allosteric enzymes, Positive and negative co-operativity with special reference to aspartate transcarbamoylase.

**Unit IV – (15 Hrs.): Enzyme immobilization:** Definition, Techniques of immobilization – adsorption, covalent binding, entrapment and membrane confinement, application of immobilized enzyme, Biosensors - calorimetric biosensors, potentiometric biosensors, Amperometric biosensors,

optical biosensors, Piezo-electric biosensors and immunosensors.

**Unit V – (15 Hrs.): Enzyme Applications:** Enzymes as analytical reagents, Enzymes as thrombolytic agents and anti-inflammatory agents, Enzymes in Medicine and industry, applications of enzymes in textile and leather industries.

### TEXT BOOKS

1. Nicholas, C. Price, (1998). **Fundamentals of Enzymology**. 2<sup>nd</sup> Edition, Oxford University Press. UK
2. Trevor Palmer, (2004). **Enzymes**. 5<sup>th</sup> 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**. 3<sup>rd</sup> Edition, C.J.R. Thorne and K.F. Tipton, Longmans Green & Co, London and Academic Press, New York.
5. Ashok Pandey, 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**. 1<sup>st</sup> Edition, Cambridge University Press. New York.
2. Chapline, Bucke C, (1990). **Protein Biotechnology**. 1<sup>st</sup> Edition, Cambridge University Press, New York.

### WEB SOURCES

[www.ebi.ac.uk/enzymeportal](http://www.ebi.ac.uk/enzymeportal)  
<http://expasy.org/enzyme/>  
<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>  
[www1.lsbu.ac.uk/water/enztech/inhibition.html](http://www1.lsbu.ac.uk/water/enztech/inhibition.html)  
<https://www.khanacademy.org/...enzymes/enzyme.../basics-of-enzyme-kinetics-graphs>

**YEAR I – SEMESTER I**  
**ANALYTICAL BIOCHEMISTRY**

Paper	: Core IV	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P1BC04	External	: 75

**SUBJECT DESCRIPTION:**

Analytical Biochemistry deal with the principles, instrumentation, working and application of the instruments commonly used in the laboratories.

**OBJECTIVES:**

To make the students learn about buffers, centrifugation techniques, chromatography, electrophoresis and spectroscopy studies.

**OUTCOME:**

Students must have easily understand the principles, instrumentation, working and application of the instruments commonly used in the laboratories.

**CONTENT:**

**Unit I – (15 Hrs.): pH and Buffers:** Definition and determination of pH, Henderson-Hasselbalch equation, Measurement of pH, pH electrode, Biological buffers, types of buffer system, In vivo and in vitro studies - organ and tissue slice techniques, tissue homogenization, Methods of cell disruption, Viscosity, surface tension, dialysis.

**Unit II – (15 Hrs.): 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 – (15 Hrs.): Chromatography:** 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, methodology and applications of Gel filtration, Methods based on affinity – principle, methodology and applications of Affinity chromatography (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 Hrs.): 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 – (15 Hrs.): Radioisotopes:** 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 Techniques of Biochemistry,** Edward Arnold Publishers. UK.
4. Gurdeep, R. Chatwal, and Sham, K. Anand, (2006). **Instrumental Methods of Chemical Analysis.** Himalaya publishing House, New Delhi.

### REFERENCE BOOKS

1. Wilson and Walker, (2000). **Practical Biochemistry: Principles & Techniques.** 5<sup>th</sup> Edition Cambridge Univ. Press, New York.
2. Pattabhi, V and Gautham, N. (2002). **Biophysics.** Narosa Publishing House, New Delhi.
3. Subramanian, M.A. (2005). **Biophysics : Principles and Techniques.** MJP Publishers, Chennai.

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[www.axis-shield-density-gradient-media.com/training-1new](http://www.axis-shield-density-gradient-media.com/training-1new)  
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**YEAR I – SEMESTER I  
MICROBIAL BIOCHEMISTRY**

Paper	: ELECTIVE - I	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P1BCE01	External	: 75

**SUBJECT DESCRIPTION:**

Microbial Biochemistry deal with the basic principles of metabolic processes within the cell and how these processes can be harnessed for biotechnology.

**OBJECTIVES:**

Basic knowledge regarding the structure and properties of micro-organisms, including those of clinical, environmental and industrial importance. A variety of laboratory exercises where students can apply their theoretical knowledge to Practical situations and demonstrations, in the above areas.

**OUTCOME:**

Students will be able to demonstrate an understanding of the major mechanisms of metabolism, energy exchanges and homeostasis in cells. Recognize the linkage between the structures, chemical properties and chemical processes of certain molecules and macromolecules, and their roles in cells and biological processes, and in certain diseases.

**CONTENT:**

**Unit I – (15 Hrs.): Microbial world:** Cellular organization of bacteria with special reference to molecular organisation of cell wall, flagella and pili, Identification and classification of bacteria, Handling and sterility maintenance in microbiological work, Methods of isolation and pure culture techniques, culture media preparation, enrichment culture, Microbial nutrition, bacterial growth and its kinetics, Cyanobacteria, Archeobacteria, Viruses - Structure, classification.

**Unit II – (15 Hrs.): Microbial metabolism:** overview, Role of chlorophylls, carotenoids and phycobilins, Chemolithotrophy, methanogenesis and acetogenesis, fermentations - diversity, syntrophy - role of anoxic decomposition, Entner - Doudoroff pathway, stickland reaction, pectin and aldo-hexuronate pathway, hydrocarbon transformation, Anaphlerotic reactions, Autotrophic metabolism, Amino acid synthesis in microbes.

**Unit III – (15 Hrs.): Bioprocess Technology:** Fermentation technology - Primary and secondary metabolites, Continuous and batch type culture techniques, Types and design of fermentors, fermentation processes, brewing, manufacture of penicillin, production of other antibiotics and organic compounds, single cell proteins, Isolation and screening of industrially important microbes, Inoculum preparation - primary and secondary strain improvement, Detection of Downstream processing.

**Unit IV – (15 Hrs.): Industrial Production:** Microbes in mineral recovery and petroleum recovery, Bioleaching and Biosorption, Production of Biomass, Production of Single cell protein

and Mushrooms, Organic acids - Acetic acid, lactic acid, citric acid and gluconic acid, Solvent production - Ethanol and Butanol, Antibiotics - Penicillin and streptomycin, Vitamins - B12 and riboflavin, Amino acid – Glutamic acid , Threonine and Phenylalanine, Fermented foods- Yoghurt, cheese, Production of beer, wine and vinegar.

**Unit V – (15 Hrs.): Industrial Application:** Wastewater treatment - physical, chemical and biological treatment processes, Effluent treatment, Bioremediation, oil spill clean-up, Microbial mining, Bio fertilizers - bacteria and blue-green algae, Biopesticides in integrated pest management - *Bacillus* and *Pseudomonas* as biocontrol agents, Soil microbiota, Biogeochemical role of soil microorganisms, Microbial degradation of xenobiotics in the environment.

#### TEXT BOOKS:

1. **Microbial biotechnology** – Alexander *et al.*, -W.H. Freeman Publishers, 1995
2. **Biology of microorganisms** – Madigan *et al.*, - Printice Hall, 2002
3. **Biochemistry of bacterial growth** – Mandelstram, Blackwell Scientific Publishers
4. **Principles of fermentation technology**, 2nd edition – Stanbury *et al.*, Pergamon Publishers, 1995
5. **Basic Biotechnology**, 2nd edition – Ratledge, Kristiansen Cambridge University Press, 2001

#### REFERENCES BOOKS:

1. **Elements of Biotechnology** – Gupta, Rastogi Publication, 1998
2. **Bioprocess Engineering** – basic concepts 2nd editon – Schuler, Karg, Printice Hall, 2001
3. **Concepts in Biotechnology** – Balasubramanian *et al.*, Universities Press (India) Ltd., 2004
4. **Animal Tissue Culture** – Freshney, IRL press
5. **Culture of animal cells: a manual of basic techniques**, 4th edition – Freshney, Wiley Liss, 2000

#### WEB SOURCES:

<http://www.sigc.edu/department/microbiology/studymet/10markQuestionsonBioprocess.pdf>  
[https://en.wikipedia.org/wiki/Entner%E2%80%93Doudoroff\\_pathway](https://en.wikipedia.org/wiki/Entner%E2%80%93Doudoroff_pathway)

**YEAR I – SEMESTER I  
CORE PRACTICAL - I**

Paper	: Core Practical I	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>17P1BCP01</b>	External	: 60

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.** 5<sup>th</sup> Edition. CBS Publishers. New Delhi.
2. Jayaraman, S. (2003). **Laboratory Manual in Biochemistry.** 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi
3. Sadasivam S and Manickam P. (2004) **Biochemical Methods.** 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc., BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
Core Practical - I**

Paper : Core Practical - I  
Examination : External  
Time : Six Hours  
Paper Code : **17P1BCP01** Maximum Marks : 60

**(Answer all the questions)**

1. a) Estimate the amount of glycogen present in the given unknown sample. (25 Marks)  
(Or)  
b) Estimate the amount of Sodium and Potassium by Flame photometry
  
2. a) Estimate the amount of Ascorbic acid from fruits (25 Marks)  
(Or)  
b) Separate the given mixture of amino acids by Paper Chromatography.

RECORD : 10

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
BIOPOLYMERS**

Paper	: Core Paper I		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P1BC01</b>	Maximum Marks	: 75

**Section A (Answer all the questions)**

- 1.(a)Discuss about the Polysaccharides? (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.

**Section-B (Answer all the 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?

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(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
CELLULAR BIOCHEMISTRY**

Paper	: Core Paper II		
Examination	: External	Section – A (5X5) :25	: 25
Time	: Three Hours	Section – B (5X10):50	: 30
Paper Code	: 17P1BC02	Maximum Marks :75	: 75

**Section A (Answer all the questions)**

- 1.(a)Discuss about the cell division? (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 bacteriorhodopsin. (Or)  
(b)Describe symporters with example?

**Section-B (Answer all the 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 peroxisomes (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.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
ENZYMOLGY AND ENZYME TECHNOLOGY**

Paper	: Core Paper III		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P1BC03</b>	Maximum Marks	: 75

**Section A (Answer all the 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?

**Section-B (Answer all the 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.

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(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
ANALYTICAL BIOCHEMISTRY**

Paper	: Core Paper IV		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P1BC04</b>	Maximum Marks	: 75

**Section A (Answer all the questions)**

- 1.(a)Write the biochemical buffers? (Or)  
(b)What are the uses of liquid nitrogen in cell disruption.
- 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.

**Section-B (Answer all the Questions)**

- 6.(a)Explain briefly about oxygen electrode. (Or)  
(b)Explain the different methods of cell disruption.
- 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.



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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2017-18)  
MICROBIAL BIOCHEMISTRY**

Paper	: Elective - I		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 30
Paper Code	: <b>17PIBCE01</b>	Maximum Marks	: 75

**Section A (Answer all the questions)**

- 1.(a) Describe about flagella and pili (Or)  
(b) Explain about the classification of viruses?
- 2.(a) Write about the role of chlorophylls? (Or)  
(b) Write about the Anaphlerotic reactions?.
- 3.(a) Write about the scope of fermentation technology? (Or)  
(b) Write short note on downstream processing?
- 4.(a) Explain about the production of single cell protein? (Or)  
(b) Give an account on the production of Penicillin?
- 5.(a) Write about the effluent treatment plant? (Or)  
(b) Write a short note on microbial degradation of xenobiotics in the environment?

**Section-B (Answer any three Questions)**

6. (a) Explain in detail about the cellular organization of gram negative bacteria?  
(Or)  
(b) Explain about the methods of isolation and pure culture techniques
7. (a) Explain about the Hydrocarbon transformation in details (Or)  
(b) Write in detail about Amino acids synthesis in microbes
8. (a) Write a short notes on types of fermentors (Or)  
(b) Give an account on the isolation and screening of industrially important microbes?
9. (a) Write in detail about bioleaching? (Or)  
(b) Give a short note on the production of fermented foods?
10. (a) Write an essay about bioremediation? (Or)  
(b) Explain about the microbial mining?

**YEAR I – SEMESTER II**  
**INTERMEDIARY METABOLISM AND REGULATION**

Paper	: Core V	Total Hours	: 7
Hours/Week	: 5	Exam Hours	: 0
Credit	: 4	Internal	: 2
Paper Code	: 17P2BC05	External	: 7

**SUBJECT DESCRIPTION:**

Intermediary metabolism and regulation deal with the synthesis of biomolecules its regulation and catabolism of biopolymers and its regulation in healthy condition.

**OBJECTIVE:**

The objective of the paper is to make the students to study about bioenergetics and metabolism of that takes place in our body. Interrelationship between carbohydrate, fat and protein metabolism. Role of purine and pyrimidines in nucleic acid metabolism.

**OUTCOME:**

Students must have learned about the principles of bioenergetics, catabolism and anabolism, the metabolic pathways.

**CONTENT:**

**Unit I – (15 Hrs.): Bioenergetics and Biological Oxidation:** Introduction, Free energy, laws of thermodynamics, Enzymes involved in redox reactions, Electron transport chain - organization and role in electron capture, Mechanism of Electron transport chain and oxidative phosphorylation, 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 Hrs.): Carbohydrate Metabolism:** An overview of carbohydrate metabolism - glycolysis and gluconeogenesis, energetic - Regulation of glycolysis and gluconeogenesis, Metabolism of glycogen and its regulation, TCA cycle steps and its regulation, glyoxalate pathway, Cori cycle, Anaplerotic reactions, Metabolism of fructose, galactose and mannose, Lactose and glycoprotein synthesis.

**Unit III – (15 Hrs.): Lipid Metabolism:** An overview of fatty acid metabolism - fatty acid synthesis and Regulation control of cetyl CoA carboxylase, Oxidation of saturated and unsaturated fatty acids, Oxidation of fatty acids with even and odd numbered carbon atoms, Alpha, beta and omega oxidation, biosynthesis and regulation of triacylglycerols, cholesterol, phosphatidyl choline, sphingomyelin, Biosynthesis and regulation of prostaglandins, Eicosanoids, thromboxanes and leucotriens, Ketogenesis and its control.

**Unit IV – (15 Hrs.): 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 Hrs.): Porphyrine Metabolism:** Regulation, biosynthesis and degradation of Hb, chlorophyll and cytochrome, Nucleic acid metabolism - Biosynthesis and degradation of purine and pyrimidines (Denovo and Salvage pathway), Regulation of Pyrimidine biosynthesis - 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**. 5<sup>th</sup> Edition, W.H.Freeman and Co., New York.
2. Donald Voet, Judith, G. Voet, and Charlotte, W Pratt, (2008).**Fundamentals of Biochemistry**, 3<sup>rd</sup> Edition. John Wiley & Sons, New Jersey.
3. Eric, E. Conn, P.K. Stumpf, G. Brueins, and Ray, H. Doi, (2005).**Outlines of Biochemistry**. 5<sup>th</sup> Edition, John Wiley and sons, Singapore.
4. Lubert Stryer, (1995). **Biochemistry**. 4<sup>th</sup> Edition .WH freeman and co, Sanfrancisco.
5. Thomas, M. Devlin, (1997).**Text book of Biochemistry**. 4<sup>th</sup> Edition A John Wiley, Inc Publication, New York.
6. Zubay G L, (1988). **Biochemistry**. 4<sup>th</sup> Edition . W M C Brown Publishers, USA.

### REFERENCE BOOKS

1. Devlin, T.M.(2002) **Textbook of Biochemistry with Clinical Correlations**. John Wileysons, 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.

### WEB SOURCES

[www.britannica.com/science/glyoxylate-cycle](http://www.britannica.com/science/glyoxylate-cycle)  
<https://www.uic.edu/classes/phar/.../transaminationofaminoacid.htm>  
[www.slideshare.net/YESANNA/transamination-deamination](http://www.slideshare.net/YESANNA/transamination-deamination)  
<http://krebbling.blogspot.in/2006/12/glyoxylate-cycle.html>

**YEAR I – SEMESTER II  
MOLECULAR BIOLOGY**

Paper	: Core VI	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P2BC06	External	: 75

**SUBJECT DESCRIPTION:**

Molecular Biology deal with the central dogma of life and its regulation.

**OBJECTIVE:**

To make the students understood the synthesis of genetic material, RNA and proteins, gene repair mechanism and gene mutation. To make the students learn about the techniques used in identifying gene mutation.

**OUTCOME:**

On successful completion of the course the students should have learned about the synthesis and functions of molecules that makes up living organisms, their mutation and identification of mutants.

**CONTENT:**

**Unit I – (15 Hrs.): 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 eukaryotes- inhibitors of replication, DNA recombination.

**Unit II – (15 Hrs.): Transcription:** Prokaryotic RNA polymerase, Initiation of transcription, chain elongation, chain termination, Eukaryotic RNA polymerases, Conserved sequences of eukaryotic promoters, Transcriptional factors and basal eukaryotic transcription complex, Enhancers, Transcriptional termination in eukaryotes, Post transcriptional processing of Pre-mRNA – addition of Cap to the 5' end, Polyadenylation of the 3' end, mechanism of intron removal and exon splicing, Inhibitors of transcription, Reverse transcription.

**Unit III – (15 Hrs.): Translation:** Genetic code - 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, Inhibitors of protein synthesis.

**Unit IV – (15 Hrs.): Protein Transport and Regulation of 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 Hrs.): DNA Repair & Recombination:** 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, DNA Recombination - Homologous genetic recombination, Site specific recombination and DNA transposition.

### TEXT BOOKS

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

### REFERENCE BOOKS

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

### WEB SOURCES

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<https://www.thoughtco.com> > ... > Science > Biology > Genetics  
<https://translate.google.com/>  
<https://www.khanacademy.org/science/.../transcription.../overview-of-transcription>

**YEAR I – SEMESTER II**  
**ENDOCRINOLOGY**

Paper	: Core VII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P2BC07	External	: 75

**SUBJECT DESCRIPTION:**

Endocrinology deal with the endocrine system of human body, mechanism of action on endocrine system and hormonal actions.

**OBJECTIVE:**

To make the students understand clearly on various alimentary parts of human body. Learnt more the endocrinal activities, learn about the mechanisms and actions of vital organs.

**OUTCOME:**

On successful completion of the course the students should have learned a detailed knowledge on endocrine organs, its significance, functions, homeostatic balance.

**CONTENT:**

**Unit I – (15 Hrs.): Hormones:** Introduction, Hormones and homeostasis, Neuroendocrine integration in homeostasis, Classes of chemical messengers, Hormone secretion, Transport and clearance, Feed back control of secretion, Mechanism of hormone action-Type I and Type II hormones, Second messengers, Cytosolic hormone receptors, Eicosonoids and hormone action.

**Unit II – (15 Hrs.): Pituitary Hormones:** Anatomy of pituitary gland, hormones of the pituitary, pathophysiology, Endocrine hypothalamus - structure, hypophysiotropic hormones, control of hypothalamic hormone secretion, Feedback 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 Hrs.): Thyroid and Parathyroid Gland:** Synthesis and chemistry of hormones, control of thyroid hormone secretion, circulation and metabolism, physiological roles, mechanism of action, Physiological role of vitamin D, Pathophysiology, 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 Hrs.): Pancreas:** Endocrine pancreas, insulin, glucagons and somatostatin, Pancreatic peptide – chemistry, physiological roles and mechanism of action, Pathophysiology, Catecholamines - synthesis, chemistry and metabolism, Neurohormones- endorphins-source, chemistry, control of secretion, physiological roles, mechanism of action and pathophysiology.

**Unit V – (15 Hrs.): Reproductive Endocrinology:** 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**, 28<sup>th</sup> Ed, Appleton & Lange Stamford, Connecticut.
2. Guyton, A.C. and Hall, J.E (2006), **Textbook of Medical Physiology**, 11<sup>th</sup> Edition, Saunders Co. Pennsylvania.

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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**. 4<sup>th</sup> Edition, The Macmillan Company, London.

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[www.btf-thyroid.org](http://www.btf-thyroid.org) > Info  
[www.hormone.org/diseases-and-conditions/adrenal](http://www.hormone.org/diseases-and-conditions/adrenal)  
[www.healthline.com/human-body-maps/pituitary-gland](http://www.healthline.com/human-body-maps/pituitary-gland)

**YEAR I – SEMESTER II**  
**IMMUNOLOGY AND IMMUNOTECHNOLOGY**

Paper	: Core VIII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P2BC08	External	: 75

**SUBJECT DESCRIPTION:**

Immunology and Immunotechnology deal with the immunity, cells and organs of immune system, mechanism of how immune cells act, to understand **infectious** diseases and interaction with the host's immune system.

**OBJECTIVE:**

To understand about immunity and its types, cells and organs, MHC and its significances and disorders and techniques in immune biology.

**OUTCOME:**

On successful completion of the course the students would have Students learned basic terminology and techniques in immunology.

**CONTENT:**

**Unit I – (15 Hrs.): Overview of Immunology and Cells and Organs of Immune system:** Historical perspective, Basic concepts of immunology- Innate and Adaptive Immunity, types of immunity, components of immune system, Cells of the Immune System, Hematopoiesis, Organs of Immune system –Primary and Secondary lymphoid organs.

**Unit II – (15 Hrs.): Antigen and Antibodies:** Antigens, Haptens, Epitopes Cross-Reactivity, Properties of the immunogen, Adjuvants, Antibodies- Structure, theories of antibody formation, side chain and clonal selection theory, Antibody classification and Biological activities, MHC Antigen processing and presentation, Monoclonal Antibodies- Production and Application, cytokines, complement system

**Unit III – (15 Hrs.): Antigen –Antibody interactions:** Principles and Applications - Strength of Antigen-Antibody interactions, Cross-Reactivity, Precipitation reactions, Agglutination reactions, Radiimmunoassay, ELISA, Western Blotting, Immunofluorescence, Humoral immune response- B Cell maturation, activation, differentiation and proliferation, Cell mediated immune response - T- cell maturation, activation and differentiation, Hypersensitivity, Immunotolerance, autoimmune disorders.



**Unit IV – (15 Hrs.): Pathophysiology of Immune System:** Immunology disorders - B cell deficiencies, T cell deficiencies, secondary immunodeficiency diseases – AIDS, HIV lifecycle, pathogenesis, immunological abnormalities, diagnosis and treatment, Transplantation immunology- allograft, typing – HLA typing and GVH reaction, organ transplantation and immune suppressive therapy

**Unit V – (15 Hrs.): Immune System in Disease:** Vaccines, Quantification of Antibody and Tumor Immunology, Isolation and characterization of immune cells, Macrophage culture and assay of macrophage activation, Tumor immunology - immune surveillance, tumor antigens, immune response to tumors, immunotherapy of tumors.

### TEXT BOOKS

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2. Immunology Roitt. Brostoff and David (1998). **Immunology**, 4<sup>th</sup> Edition, Mosby Times Mirror Int Pub Ltd.
3. Kuby Richard, (2000). **Immunology**, 4<sup>th</sup> Edition, W.H. Freeman and Company, New York.
4. Abbas *et al.*, (1994). **Cellular and Molecular Immunology** 2<sup>nd</sup> Edition, W.S. Saunders
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3. Charles. A. Janeway, (1994). J.R. Paul **Immunology** 4<sup>th</sup> Edition. Black well Scientific Publishers,
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[www.quickhack.net/](http://www.quickhack.net/)

<https://www.sciencebasedmedicine.org/>

[www.slideshare.net/...](http://www.slideshare.net/)

<https://www.aids.gov/hiv-aids-basics/>

[www.KeepAChildAlive.org/](http://www.KeepAChildAlive.org/)

**YEAR I – SEMESTER II**  
**PLANT BIOCHEMISTRY AND PLANT BIOTECHNOLOGY**

Paper	: Elective - II	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 3	Internal	: 25
Paper Code	: 17P2BCE02	External	: 75

**SUBJECT DESCRIPTION:**

Plant biochemistry and Plant biotechnology deal with the plant and animal tissue culture methods, and mechanism of gene transfer, Methods of selection, Production of novel proteins and their applications.

**OBJECTIVE:**

To make the students understand the components of culture media and various tissue culture techniques. Learnt about the technique of genetic engineering in plants and animals.

**OUTCOME:**

On successful completion of the course the students should have learned about plant and animal tissue culture methods, and mechanism of gene transfer, Methods of selection, Production of novel proteins and their applications.

**CONTENT:**

**Unit I – (15 Hrs.): Photosynthesis:** Photosynthetic apparatus, organisation of thylakoid, role of chlorophylls, carotenoids and other photosynthetic pigments, light absorption and energy conservation, Light – properties of both particle and wave, light absorption by pigment molecules, Photosystems I and II, Electron transport pathways in chloroplast membranes, ATP synthesis in chloroplasts, cyclic and noncyclic photophosphorylation

**Unit II – (15 Hrs.): Carbon Reactions & Transpiration:** C<sub>3</sub>, C<sub>4</sub> and CAM plants - Calvin cycle; Hatch-Slack pathway, Photorespiration in plants, biochemical basis of PR pathway – C<sub>2</sub> cycle, Pathways of glucose oxidation in plants, starch biosynthesis and degradation, metabolic transport between organelles, Overview of lipid and protein metabolism in plants, Transpiration-Types, theories of transpiration, mechanism and factors affecting transpiration.

**Unit III – (15 Hrs.): 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, Inter relationship between photosynthesis and nitrogen metabolism.

**Unit IV – (15 Hrs.): Structure of Plant Genes:** Structure, transport, distribution, mechanism of action and physiological effects of Auxin, gibberellins, cytokinins, abscisic acid, ethylene, Phytochrome, Biological clock, Plant genome organization, Nuclear, chloroplast and mitochondrial genomes, 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, potato virus X) as vectors, Advantages and uses of transgenic plants.

**Unit V – (15 Hrs.): 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**. 3<sup>rd</sup> Edition, Elsevier Academic Press Publication, USA.
- 2.Lea, P.J. and Leegood, R.C.(1999). **Plant Biochemistry and Molecular Biology**. 2<sup>nd</sup> 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**.2<sup>nd</sup> Edition,CBS Publishers, New Delhi.

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- 1.Hans,Walter-Heldt,(1997).**Plant Biochemistry and Molecular Biology**. 3<sup>rd</sup> Edition Academic Press, California.
- 2.Nicholls (2002). **Genetic Engineering**. 2<sup>nd</sup> Edition,Cambridge University Press. UK.
- 3.Primrose (2001) **Principles of Gene Manipulation**. 6<sup>th</sup> Edition Blackwell Scientific Publishers. UK.
- 4.Jeffrey,W. Pollard, and John, M. Walker, (1997). **Basic Cell Culture Protocol**. 2<sup>nd</sup> Edition, Humana Press Totawa, New Jersey.
- 5.Narayanaswamy, S. (1999). **Plant Cell and Tissue Culture**. 2<sup>nd</sup> Edition,Tata McGraw Hill Publishing Company Ltd, New York.

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**YEAR I – SEMESTER II  
CORE PRACTICAL – II**

Paper	: Core Practical II	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>17P2BCP02</b>	External	: 60

**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. Separation of LDH by SDS-PAGE.

**REFERENCES**

1. David, T. Plummer, (1988). **An Introduction to Practical Biochemistry**. 3<sup>rd</sup> Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Pattabiraman, T.N. (1998). **Laboratory Manual in Biochemistry**. 3<sup>rd</sup> Edition. All India Publishers and Distributors. Chennai.
3. Jayaraman, S. (2003). **Laboratory Manual in Biochemistry**. 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi
4. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Intermediary Metabolism And Regulation**

Paper	: Core Paper V		
Examination	: External	Section – A (5X5) : 25	: 25
Time	: Three Hours	Section – B (5X10): 50	: 30
Paper Code	: <b>17P2BC05</b>	Maximum Marks : 75	: 75

**Section A (Answer all the 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

**Section-B (Answer all the 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 energetics (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

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Molecular Biology**

Paper	: Core Paper VI		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P2BC06</b>	Maximum Marks :	: 75

**Section A (Answer all the 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)  
b) Write 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.

**Section-B (Answer all the 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

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Endocrinology**

Paper	: Core Paper VII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P2BC07</b>	Maximum Marks : 75	: 75

**Section A (Answer all the 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)
- b) Write 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

**Section-B (Answer all the 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 calcium homeostasis
8. a) Write in detail about Thyroid hormones (Or)
- b) Write short notes on MSH melatonin
9. a) Write in detail about glucagon and somatostatin (Or)
- b) Write a short note on neurohormone
- 10.a) Write a short notes on androgen (Or)
- b) Write about human infertility

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Immunology and Immunotechnology**

Paper	: Core Paper VIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 17P2BC08	Maximum Marks : 75	: 75

**Section A (Answer all the questions)**

1. a) Define hematopoiesis? (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 Nephelometry.(Or)  
b) Write short note on tumor antigens.

**Section-B (Answer all the 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 note 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 activate (Or)  
(b) Explain about the purification and quantification of antibody.



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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Plant Biochemistry and Plant Biotechnology**

Paper	: Elective - II		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P2BCE02</b>	Maximum Marks : 75	: 75

**Section A (Answer all the 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

**Section-B (Answer all the 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 short notes on protoplast transformation
10. a) Write a short notes somoclonal variation (Or)  
b) List out uses of plant tissue culture

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MODEL QUESTION PAPER M.Sc., BIOCHEMISTRY  
YEAR I – SEMESTER II (2017-18)  
Core Practical - II**

Paper	: Core Practical - II		
Examination	: External		
Time	: Six Hours		
Paper Code	: <b>17P2BCP02</b>	Maximum Marks	: 60

**(Answer all the questions)**

1. a) Find out the effect of pH on the activity of amylase. (25 Marks)  
(Or)  
b) Separate the isoenzyme LDH by SDS PAGE
2. a) Find out the effect of temperature on the activity of urease. (25 Marks)  
(Or)  
b) Perform the technique of enzyme immobilization by matrix entrapment.

**Record: 10**

**YEAR II – SEMESTER III  
ADVANCED CLINICAL BIOCHEMISTRY**

Paper	: Core IX	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>17P3BC09</b>	External	: 75

**SUBJECT DESCRIPTION:**

Advanced Clinical Biochemistry deal with the diagnostic importance of various metabolic disorders and to know the clinical aspects of various metabolic disorders.

**OBJECTIVE:**

The aim is decided to be fulfilled with the following objective of studying about basic laboratory practices, disorders of biopolymers, and other clinical disorders and its significance.

**OUTCOME:**

On successful completion of the course the students would have learned about diagnostic importance of various metabolic disorders and clinical aspects of various metabolic disorders.

**CONTENT:**

**Unit I – (15 Hrs.): 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 Hrs.): Disorders of carbohydrate metabolism** (Hyperglycemia and Hypoglycemia): Diabetes Mellitus, Renal Threshold Value, 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 Hrs.): 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.

**Unit IV – (15 Hrs.): Clinical Tests:** 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 Hrs.): Haematological Tests:** 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 4<sup>th</sup> 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** 6<sup>th</sup> 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** 11<sup>th</sup> Edition Harcourt Asia.
4. Thomas M.Devlin,(2010). **Text book of biochemistry with clinical correlations** 7<sup>th</sup> Edition John Wiley & Sons
5. **Praful B. Godkar, Darshan P. Godkar(2014)** Textbook of Medical Laboratory Technology: Clinical Laboratory Science and Molecular Diagnosis 3<sup>rd</sup> Edition, **Bhalani Publishing House.**

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**YEAR II – SEMESTER III  
DRUG BIOCHEMISTRY**

Paper	: Core X	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>17P3BC10</b>	External	: 75

**SUBJECT DESCRIPTION:**

Drug Biochemistry deal with the the drug dependency, its absorption, mechanism of action.

**OBJECTIVE:**

The objective of the course is to learn about pharmaceutical industry, drug and its mode of action and the method by which it can be synthesized, and developed.

**OUTCOME:**

On successful completion of the course the students would have understood about the development of the traditional and modern methods used for drug discovery; of how molecules interact.

**CONTENT:**

**Unit I – (15 Hrs.): Drug Classification:** 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 Hrs.): Drug Tolerance:** Adverse response to drugs, 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 Hrs) : Drugs for Diseases I:** 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 Hrs.): Drugs for Diseases I:** 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 inducing drugs.

**Unit V – (15 Hrs.): Drugs of plant origin:** Drug dependence and abuse – Management of self

poisoning cancer, Chemotherapy – Cytotoxic drug, Immuno suppressive drug therapy, CADD  
New Biological Targets for Drug Development, Novel Drug Screening Strategies.

### TEXT BOOKS

1. Willam.O.Foye, (1995) **Principles of Medicinal Chemistry** 4<sup>th</sup> 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** 7<sup>th</sup> Edition – Katzung, Printice Hall, New Delhi
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2. Glick, Pasternak, (2002) **Molecular Biotechnology** 2<sup>nd</sup> Edition ak, Panima Publishers,
3. Davies,**Molecular Basis of Inherited Diseases** s, Read, IRL Press
4. Rang, Tale **Pharmacology** 3<sup>rd</sup> Edition
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**YEAR II – SEMESTER III**  
**GENETIC ENGINEERING AND FERMENTATION TECHNOLOGY**

Paper	: Core XI	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>17P3BC11</b>	External	: 75

**SUBJECT DESCRIPTION:**

Genetic Engineering and Fermentation technology deal with the basis of gene cloning, vectors, genetic engineering techniques and large scale production of biochemical by fermentation technology.

**OBJECTIVE:**

The objective of the course is to learn about the basics, vectors, methods of gene cloning. Techniques and application of gene technology.

**OUTCOME:**

On successful completion of the course the student should have understood about the basis of gene cloning, vectors, genetic engineering techniques and large scale production of biochemical by fermentation technology.

**CONTENT:**

**Unit I – (15 Hrs.): Introduction to Gene Manipulation** – Basic techniques of Genetic Engineering - Restriction modification enzymes used in recombinant DNA technology, 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. Cloning vectors - Plasmid cloning vector PBR322, other plasmid vectors, Vectors for cloning large piece of DNA, Bacteriophage vectors and other phagevectors, 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 – (15 Hrs.): 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 – (15 Hrs.): 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, SiRNA,

MicroRNA , Ribozymes , Artificially designed aptamers.

**Unit IV – (15 Hrs.): 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 – (15 Hrs.): 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.

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1. Glick, B.R. and Pasternak, (2010) .**Molecular Biotechnology** 4<sup>th</sup> Edition Pasternak, J.J. ASM Press,USA
- 2 Sambrook, J. Molecular cloning. (2001). **A Laboratory Manual** 3<sup>rd</sup> Edition , USA
- 3 Watson, W.H.Freeman(1992).**Recombianant DNA** 2<sup>nd</sup> Edition.Freeman and Co., NY
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3. Principles of **Gene Manipulation and Genomics** 7<sup>th</sup> Edition. Blackwell pub., NY.

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**YEAR II – SEMESTER III  
RESEARCH METHODOLOGY**

Paper	: Elective - III	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>17P3BCE03</b>	External	: 75

**SUBJECT DESCRIPTION:**

Research Methodology deal with the knowledge on the basic concepts of research and its methodologies and identify appropriate research topics.

**OBJECTIVE:**

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

**OUTCOME:**

On successful completion of the course the student would have understood about basic concepts of research and its methodologies and identify appropriate research topics.

**CONTENT:**

**Unit I – (15 Hrs.): 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 – (15 Hrs.): Measures of central tendency:** Arithmetic mean, median, mode, quartiles, deciles and percentiles, Measures of variation - range, quartile and Quartile deviation, mean deviation, standard deviation, Correlation analysis - Scatter diagram, Karl Peason's coefficient of correlation and Spearman's rank method, Regression analysis - Regression line, Regression equation.

**Unit III – (15 Hrs.): Probability** - Definition, concepts, Addition and Multiplication theorems (proof of the theorems not necessary) and calculations of probability, Theoretical, distributions, Binomial, Poisson, Fit a Poisson distribution, Normal distribution - importance, properties, conditions and constants of the distribution (proof not necessary), Simple problems.

**Unit IV – (15 Hrs.): Sampling distribution and test of significance:** Testing of hypothesis, errors in hypothesis testing, standard error and sampling distribution, sampling of variables (large samples and small samples ), Student's 't' distribution and its applications, Chi - square test & goodness of fit.

**Unit V – (15 Hrs.): Bioethics And Patenting:** Declaration of Bologna, Ethics in animal experimentation, CPCSEA guidelines - Animal care and technical personnel environment, animal husbandry, feed, bedding, water, sanitation and 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.

### 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. Biostatistics – A foundation for analysis in health Science Danien.
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2. Statistical Methods, Snedocor GW and Cochran WG, Oxford and IBH Publishing CO
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4. Biometry, Sokal RR and Rohlf FJ, Freeman WH Publishing House
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6. Contemporary issues in Bioethics, Beauchamp & Leroy, 1999. Wardsworth Pub. Co. Belmont, California
7. Ethical Guidelines for Biomedical Research on Human Subjects (2000). ICMR, New Delhi.

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**YEAR II – SEMESTER III  
CORE PRACTICAL III**

Paper	: Core Practical - III	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>17P3BCP03</b>	External	: 60

**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 Urine by 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**. 3<sup>rd</sup> Edition. Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Pattabiraman, T.N. (1998). **Laboratory Manual in Biochemistry**. 3<sup>rd</sup> Edition. All India Publishers and Distributors. Chennai.
3. Jayaraman, S. (2003). **Laboratory Manual in Biochemistry**. 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi
4. Sadasivam S and Manickam P. (2004) **Biochemical Methods**. 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi.

**YEAR II – SEMESTER IV  
NEUROSCIENCE**

Paper	: Core XII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 5	Internal	: 25
Paper Code	: <b>17P4BC12</b>	External	: 75

**SUBJECT DESCRIPTION:**

Neuroscience deal with the understanding of the functions of various sensory organs in human system, biochemical aspects behind diseases associated with the nervous system and effect of drug therapy.

**OBJECTIVE:**

To enable the students to gain knowledge about the structure and functions of the nervous system and have basic understanding of the functions of various sensory organs in human system. To learn the biochemical aspects behind diseases associated with the nervous system and effect of drug therapy.

**OUTCOME:**

On successful completion of the course the student would have understood about structure and functions of the nervous system and have basic understanding of the functions of various sensory organs in human system.

**CONTENT:**

**Unit I – (15 Hrs.): Nervous system:** Classification, General functions of autonomic and somatic nervous system, Neuron - Structure, Properties - excitation and action potential, Neuroglia - structure and properties, Receptors – sensory, Synapse-properties and functions, Neurotransmitters-structure and types, Receptors for neurotransmitters - cholinergic, adrenergic, nicotinic and muscarinic, Conduction of nerve impulse (excitatory and inhibitory transmission).

**Unit II – (15 Hrs.): Brain and Spinal cord:** Chemistry, Structure and functions, Brain metabolism and metabolic adaptation, Neuro hormones and neuromodulators, Biochemical aspects of behavior, sleep, learning and memory.

**Unit III – (15 Hrs.): Sensory systems:** Somatic sensation - Perception of pain, Analgesia system in the brain and spinal cord, Special senses – Vision, photoreceptors, Visual cycle - Rod cell adaptation, Color vision - role of cone cell, Color blindness, Mechanism of hearing, Biochemical aspects of taste and smell.

**Unit IV – (15 Hrs.): Neurodegenerative disorders:** Dementia, Schizophrenia, Huntington’s disease, Parkinsonism and Alzheimer’s disease, Neuromuscular diseases - Muscular dystrophy, Tetanus and botulism.

**Unit V – (15 Hrs.): Pharmacology of nervous System:** CNS depressants (sedative, hypnotics), CNS stimulants, analgesics, antipsychotics and mood stabilizing drugs, Drug therapy Huntington’s disease, Parkinsonism and Alzheimer’s disease.

#### TEXT BOOKS:

1. Arthur C. Guyton and John E. Hall. 2007. **Text Book of Medical Physiology**. [Eleventh Edition]. Elsevier Publications, New Delhi. .
2. Gerald. J. Tortora and Sandra Reynolds. 2003. **Principles of Anatomy and Physiology**. [Tenth Edition]. John Wiley and Sons. Inc. Pub. New York..
3. Tripathi, K. D. 1999. **Essentials of Medical Pharmacology**. [Fourth Edition]. Jaypee Brothers Medical Publishers. New Delhi

#### REFERENCE BOOKS:

1. George I. Siegel, 2000. **Basic Neurochemistry**. [Seventh Edition]. Academic Press, New Delhi.
2. Kathleen J. W. Wilson and Anne Waugh. 1998. **Anatomy and Physiology in Health and Illness**. [Eighth Edition]. Churchill Livingstone, New York.

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**YEAR II – SEMESTER IV**  
**BIOINFORMATICS & NANOTECHNOLOGY**

Paper	: Core XIII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P4BC13	External	: 75

**SUBJECT DESCRIPTION:**

Bioinformatics and Nanotechnology deal with the understanding of Biological databases, Tools for database search, Protein structure analyses and prediction and drug design.

**OBJECTIVE:**

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.

**OUTCOME:**

Students learn about Biological databases, Tools for database search, Protein structure analyses and prediction and drug design and nanoparticles.

**CONTENT:**

**Unit I – (15 Hrs.): Database searches and sequence alignment:** Searching sequence database sequence similarity searches, amino acid substitution matrices, Database searchers - FASTA and BLAST, sequence filters, Iterative database searches and PSIBLAST, Multiple sequence alignment – gene and protein families.

**Unit II (15 Hrs.): Applications:** Prediction and visualization of protein structure, Drug discovery and development, combinatorial chemistry and docking, Pharmacogenomics, Pharmacogenetics, Toxicogenomics, Functional genomics, metabolomics, E-cell.

**UNIT III (15 Hours) : Metabolomics:** Metabolic pathways- Kegg and Wit, primer design, Microfluidics. Nanotechnology. Phylogenetics- building phylogenetic trees, Evolution of macromolecular sequences, Sequence annotation.

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

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

**UNIT V (15 Hours): Nano-structured materials:** Fullerenes – properties and Characteristics. Carbon Nanotubes – Characteristics and Applications. Quantum Dots and Wires. Gold Nanoparticles. Nanopores. Applications of NanoMolecules in Biosystems.

### 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, Academic press
3. Harshawaedhan .P. Bal **Bioinformatics** Principles and Application
4. Janusz M. Bujnicki (2008) **Practical Bioinformatics** Springer Berlin.

### REFERENCE BOOK

1. Rohit Majumdar **Nanotechnology** – Basic science and Emerging Technologies
2. Nanotechnology – **Fundamentals and Application** – Mansi Kar Kare
3. Nanoscience and technology - K.P. Mathar.
4. Mount Davit. **Bioinformatics sequence and genome analysis** 2<sup>nd</sup> Edition
5. Liebler, Humana (2002) **Introduction to proteomics: Tools for new biology** Liebler, Humana W. CBS pub.,
6. S. Pennington (2002) **Proteomics: From protein sequence to function**
7. Bryan Bergeron (2003) **Bioinformatics computing**
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**YEAR II – SEMESTER IV  
HUMAN PHYSIOLOGY**

Paper	: Core XIV	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 17P4BC14	External	: 75

**SUBJECT DESCRIPTION:**

Human Physiology deal with the understanding of biological, physiological activities along with the mechanism of action of various organs and its anatomy.

**OBJECTIVE:**

The objective of the subject is to make the students learn about various parts of alimentary parts of human body. Learnt more specific on the nervous activities.

**OUTCOME:**

Students can be able to learn about the anatomy, biological, physiological activities along with the mechanism of action of various organs and various alimentary parts of human body.

**CONTENT:**

**Unit I – (15 Hrs.): Physiology of vision:** Structure of eye, image formation and defects of the eye, Receptor mechanism of the eye, photopigments, Visual cycle and colour adaptation  
Skeletal Muscle - Structure of skeletal muscle, contraction of muscle fibre, chemical changes during muscle contraction, sources of energy of muscle contraction.

**Unit II – (15 Hrs.): Blood and Body fluids:** Composition and function, Red blood cells, Hemoglobin, white blood cells and platelets. Blood coagulation, blood groups and blood transfusion, Formation and functions of lymph, Body buffers, Digestive system - Secretion of digestive juices, digestion and absorption of carbohydrates, proteins and fats, Gastro intestinal hormones.

**Unit III – (15 Hrs.): Respiratory system:** Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, factors influencing the transport of oxygen, Transport of CO<sub>2</sub> from tissues to lungs through blood, factors influencing the transport of CO<sub>2</sub>, Excretory System - Mechanism of formation of urine, composition of urine, Micturition, Renal regulation of acid balance, hormone of the kidney.

**Unit IV – (15 Hrs.): Nervous system:** Structure of neuron, resting potential and action potential, Propagation of nerve – impulses, Structure of synapse, synaptic transmission (electrical and chemical theory), Structure of Neuro muscular junction and mechanism of neuro



muscular transmission, neurotransmitters.

**Unit V – (15 Hrs.): Male Reproductive system:** Structure of testis, Spermatogenesis, functions of testis, Female Reproductive system - Ovarian cycle, Structure and hormones of ovaries, menstrual cycle, menopause, pregnancy and lactation, Steroids as contraceptives.

## TEXTBOOKS

1. Textbook of Medical Physiology (2011) 10th ed., Guyton, A.C. and Hall, J.E., Reed Elsevier

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2. Chatterjee A.C (2004) **Human Physiology**,. Volume I & II. 11<sup>th</sup> Edition Medical agency allied, Calcutta

3. Vander's Human Physiology (2008) 11th ed., Widmaier, E.P., Raff, H. and Strang, K.T., McGraw Hill International Publications (New York), ISBN: 978-0-07-128366-3.

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1. William. F. Ganong, (2003) **Review of Medical Physiology**, 14<sup>th</sup> Edition, A Lange Medical book.

2. M.M. Muthiah **Text book of biochemistry, Lecture notes on human physiology** Vol II 1991.

3. Gerard J Tortora and Bryan Derrickson **Principles of anatomy and physiology**, 14<sup>th</sup> Edition.

4. Martini, F.H. and Nath, J.L., (2009), **Fundamental of Anatomy and Physiology** 8th ed., Pearson Publications (San Francisco), ISBN: 10:0-321-53910-9 / ISBN: 13: 978-0321-53910-

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**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2017-18)  
Advanced Clinical Biochemistry**

Paper	: Core Paper IX		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 17P3BC09	Maximum Marks	: 75

**Section A (Answer all the questions)**

1. a) Write about Amniotic fluids (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.

**Section-B (Answer all the 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 blood clotting

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2017-18)  
Drug Biochemistry**

Paper	: Core Paper X		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P3BC10</b>	Maximum Marks	: 75

**Section A (Answer all the questions)**

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 therapy. (Or)  
b) Write short note on novel drug screening strategies.

**Section-B (Answer all the 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 therapy.
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.

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2017-18)  
Genetic Engineering and Fermentation Technology**

Paper	: Core Paper XI		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 17P3BC11	Maximum Marks	: 75

**Section A (Answer all the questions)**

- 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 screen fermentation process.
- 5.a) Advantages & disadvantages of cell culture (Or)  
b) How to prepare the culture medium.

**Section-B (Answer all the Questions)**

- 6.a) How to developed the gene & its importance (Or)  
b) Explain about Isolation & purification of DNA
- 7.a) Write about plasmid DNA & its types (Or)  
b) Explain human artificial chromosome
- 8.a) Write about DNA manipulating enzymes (Or)  
b) How to perform the restriction enzyme in cloning process.
9. a) Explain design of fermentor& function (Or)  
b)Describe about Downstream processing technique.
10. a) How to develop embryo culture method (Or)  
b) Explain about Isolation & purification of stem cells.

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2017-18)  
Research Methodology**

Paper	: Elective III		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 17P3BCE03	Maximum Marks	: 75

**Section A (Answer all the questions)**

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 the scope 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.

**Section-B (Answer all the 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)

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2017-18)  
Core Practical - III**

Paper : Elective III  
Examination : External  
Time : Six Hours  
Paper Code : **17P3BCP03** Maximum Marks : 60

**Answer all the questions**

1 (a). Estimate the amount of glucose present in the given blood sample by Ortho Toluidine method.

(Or)

(b) Estimate the amount of Chloride in the given urine sample by Schales and Schales method.

2 (a). Estimate the amount of creatinine present in the given serum sample by alkaline picrate method.

(Or)

(b) Estimate the amount of urea present in the given urine sample by DAM method.

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER IV (2017-18)  
Neuroscience**

Paper	: Core Paper XII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 17P4BC12	Maximum Marks	: 75

**Section A (Answer all the questions)**

1. a) Describe about neuroglia (Or)  
b) Explain about synapse
2. a) Write about neurohormones (Or)  
b) Write about memory
3. a) Write about the somatic sensation (Or)  
b) Write short note on colour blindness
4. a) Explain about dementia (Or)  
b) Give an account on muscular dystrophy
5. a) Write about CNS stimulants (Or)  
b) Write a short note on analgesics

**Section-B (Answer all the Questions)**

6. (a) Explain in detail about autonomic nervous system.(Or)  
(b) Explain about the conduction of nerve impulse
7. (a) Explain about the structure and function of brain (Or)  
(b) Write in detail about neuromodulators
8. (a) Write a short notes on photoreceptors (Or)  
(b) Give an account on biochemical aspects of taste and smell
9. (a) Write in detail about Huntington's disease (Or)  
(b) Give a short note on tetanus and botulism
10. (a) Write an essay about CNS depressants. (Or)  
(b) Explain about the drug therapy of neuro disease

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER IV (2017-18)  
Bioinformatics and Nanotechnology**

Paper	: Core Paper XIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>17P4BC13</b>	Maximum Marks	: 75

**Section A (Answer all the questions)**

1. a) Write about the Bioinformatics (Or)  
b) Explain about FASTA format
2. a) Write about the Bioinformatics (Or)  
b) Explain about FASTA format
3. a) How to search the sequences (Or)  
b) How to do the substitute 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

**Section-B (Answer all the Questions)**

6. (a) Explain the Multiple Sequence alignment (Or)  
(b) Describe Topology of Computer
7. (a) Briefly explain the Bioinformatics tool (Or)  
(b) Explain Phylogenetic analysis
8. (a) Describe the drug discovery & development (Or)  
(b) Evaluation 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



**M.Sc., BIOCHEMISTRY**  
**QUESTION PAPER PATTERN**  
**MAXIMUM MARKS – 75 marks**  
**DURATION – 3 hours**

**PART – A (5X 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