

## COLLEGE VISION AND MISSION

### Vision

- To evolve into a center of excellence in higher education through creative and innovative practices to social equity for women.

### Mission

- To provide sufficient learning infrastructure to the students to pursue their studies.
- To provide good opportunity for higher education and conducive environment to the students to acquire education.
- To provide quality academic programs training activities and research facilities.
- To facilitate industry-institute interaction.

## DEPARTMENT

### Vision

To be recognized as a centre for excellence in Biochemistry that provides an atmosphere to acquire skills in identifying the link between biological and human resources and transform it to enhance the quality of life.

### Mission

- To help the students to gain more knowledge through visit to research Institutions, Industries, and hospitals through Job training and project work.
- To give an opportunity to students to meet eminent scientists working in various fields of Biochemistry by way of invited lectures, seminars & workshops
- Designing strategies and catalysts for making chemical bonds in new ways
- To provide opportunities to get hands on experience in –
  - Research oriented education in Biochemistry
  - Programming and application skills in Bioinformatics and Drug Designing
  - Molecular Biology and Biotechnology
  - Apprenticeship in industries and service agencies
  - Entrepreneurship in Biochemistry-related areas.
- Promote research based projects/activities in the emerging areas of technology convergence.

### Programme Educational Objectives

- To afford fundamentals and applications of current biochemical concepts at an advanced level
- To inculcate broad variety of modern instrumentation of classical techniques in the course of biological investigations.
- To Promote the research in the thrust areas of modern biochemistry ranging from structural biology to gene activity and regulation.
- To equip with the up-to-date skills of evolving technologies as per industrial forecast

### After completion of the program the Graduates will be able to

PO1: A better understanding of the key principles of biochemical functioning at an advanced level.

PO2: Ability to design of carryout experimental and to interpret experimental data.

PO3: Production of substantial original research of significance of quality sufficient for publication

PO4: Acquire a holistic professional career in hospitals, food and pharmaceutical industries.

**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	Marks (25)	Activity	Marks (40)
Attendance	5	Attendance	5
CA Test I	2.5	CA Test I/Review	5
CA Test II	2.5	CA Test II/Review II	5
Model	10	Model/Model Presentation	10
Assignment	5	Observation note and result in lab	15
	<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 valued 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

a) 75 % and above shall be declared to have passed the examination in first class with

Distinction provided they pass all the examinations prescribed for the course at first appearance itself.

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

### **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 two academic years comprising of four semesters and passed the examinations prescribed and fulfilled such conditions as 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 2018-19 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2018-19 and thereafter.

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

Candidates who have undergone the PG Course of study before 2018-19 shall be permitted to appear for the examinations under those regulations for a period of two years i.e., upto and inclusive of the examination of April/May 2020-2021. 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+2)

**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	Elective I	5	3	3	25	75	100
Practical – I	5	4	6	40	60	100	Practical-III	5	4	6	40	60	100
Practical – II	5	4	6	40	60	100	Practical – IV	5	4	6	40	60	100
<b>Total</b>	<b>30</b>	<b>24</b>	<b>24</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>Total</b>	<b>30</b>	<b>23</b>	<b>24</b>	<b>180</b>	<b>420</b>	<b>600</b>
<b>I YEAR TOTAL</b>								<b>60</b>	<b>47</b>	<b>48</b>	<b>360</b>	<b>840</b>	<b>1200</b>
<b>YEAR II</b>													
<b>Semester III</b>							<b>Semester IV</b>						
Core Paper VIII	5	4	3	25	75	100	Core Paper XI	5	5	3	25	75	100
Core Paper IX	5	4	3	25	75	100	Core Paper XII	5	4	3	25	75	100
EDC	5	4	3	25	75	100	Core Paper XIII	5	4	3	25	75	100
Core Paper X	4	4	3	25	75	100	Project Work	15	4	6	40	60	100
Practical – V	5	4	6	40	60	100							
Practical – VI	4	3	6	40	60	100							
Internship Training Programme		2		40	60	100							
Human Rights	2	2	3	25	75	100							
<b>Total</b>	<b>30</b>	<b>27</b>	<b>27</b>	<b>245</b>	<b>555</b>	<b>800</b>	<b>Total</b>	<b>30</b>	<b>17</b>	<b>15</b>	<b>115</b>	<b>285</b>	<b>400</b>
<b>II YEAR TOTAL</b>								<b>60</b>	<b>44</b>	<b>42</b>	<b>360</b>	<b>840</b>	<b>1200</b>
<b>TOTAL CREDIT FOR THE COURSE</b>								<b>120</b>	<b>91</b>	<b>90</b>	<b>720</b>	<b>1680</b>	<b>2400</b>

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
(AUTONOMOUS)  
DEPARTMENT OF BIOCHEMISTRY  
CBCS AND OBE PATTERN SYLLABUS - PG  
(For candidates admitted from 2018-2019 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 – Immunology and Immunotechnology	5	4	3	25	75	100
Paper IV – Analytical Biochemistry	5	4	3	25	75	100	Elective II – Plant Biochemistry and Plant Biotechnology Endocrinology	5	3	3	25	75	100
Practical I	5	4	6	40	60	100	Practical III	5	4	6	40	60	100
Practical – II	5	4	6	40	60	100	Practical – IV	5	4	6	40	60	100
<b>Total</b>	<b>30</b>	<b>24</b>	<b>24</b>	<b>180</b>	<b>420</b>	<b>600</b>	<b>Total</b>	<b>30</b>	<b>23</b>	<b>24</b>	<b>180</b>	<b>420</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 VIII –Advanced Clinical Biochemistry	5	4	3	25	75	100	Paper XI – Neuroscience	5	5	3	25	75	100
Paper IX – Research Methodology	5	4	3	25	75	100	Paper XII – Bioinformatics and Nanotechnology	5	4	3	25	75	100
Paper X –Genetic Engineering and Fermentation Technology	5	4	3	25	75	100	Paper XIII – Human Physiology	5	4	3	25	75	100
EDC -	4	4	3	25	75	100	Project Work	15	4	6	40	60	100
Practical - V	5	4	6	40	60	100							
Practical – VI	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>27</b>	<b>245</b>	<b>555</b>	<b>800</b>	<b>Total</b>	<b>30</b>	<b>17</b>	<b>15</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>

**I YEAR I SEMESTER  
BIOPOLYMERS**

Paper : Core I  
Hours/Week : 5  
Credit : 4  
Paper Code : 18P1BC01

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Familiarize about the definition, occurrence, and types of various biomolecules	K1 & K2
CO2	Recall and understand the classification, chemistry and functions of macro and micro nutrients.	K1 & K2
CO3	Imbibe and interpret the chemical reactions of monosaccharides, amino acids and structural organization of various biomolecules.	K1, K2 & K3
CO4	Evolve the physiological functions and significance of macro and micro nutrients.	K3 & K4
CO5	Correlate the need of macro and micro nutrients with the metabolic and physiological functions of the human body.	K3 & K4

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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**. 4<sup>th</sup> Edition, Inc Publication, New York.
6. Albert L. Lehninger, **Biochemistry** (2015), second edition, Kalyani publishers.
7. **Biochemistry**, David Hames & Nigel Hooper, 4<sup>th</sup> edition, 2015., Garland sciences, Taylor & Francis group, LLC.

**WEB OF RESOURCES**

<http://ull.chemistry.uakron.edu/genobc/>.

<http://www.biology.arizona.edu/biochemistry/biochemistry.html>.

<https://www.sciencedirect.com/topics/neuroscience/dna-binding-protein>

**PEDOGOGY: CHALK and Talk , PPT**

**YEAR I – SEMESTER I**  
**CELLULAR BIOCHEMISTRY**

Paper	: Core II	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 18P1BC02	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:**

Course No	Coarse Outcome	Knowledge Level
CO1	Enrich the knowledge on structural configuration, functions and deviation mechanism of cell	K1 & K2
CO2	Understand the structure, composition and organization of cell organelles	K1 & K2
CO3	Learn about the cellular interaction and types and mechanism of cell signaling process	K1, K2 & k3
CO4	To study the mechanism of programmed cell death process.	K3 & K4
CO5	Know about membrane molecules and their structure and functions	K3 & K4

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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, Tumor suppressor genes-p53, Bc12 and Bax. Cancer markers- AFP, IL-1, BRCA1 and BRCA2. Carcinogenic effect of chemicals and radiation.

**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.
5. David L. Nelson and Micheal M. Cox (2007) Principles of biochemistry 4<sup>th</sup> edition and 7<sup>th</sup> edition Sara tenney publishers.

**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:**

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

**PEDOGOGY: CHALK and Talk , PPT****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	: <b>18P1BC03</b>	External	: 75

**SUBJECT DESCRIPTION:**

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

**OBJECTIVES**

The Students should update their knowledge about the enzyme and its role in all stages of metabolism and biochemical reaction. This course will describe a clear idea about an isolation of enzyme, characteristic properties, production on bench scale to pilot scale and their application in bio-industries.

**COURSE OUTCOMES**

Course No	Coarse Outcome	Knowledge Level
CO1	Know about the key structural and energetic factors which increase enzyme stability	K1 & K2
CO2	Understand about the role of enzyme as a catalyst in biological process	K1 & K2
CO3	Interpret the optimum pH, Temperature , Concentration of enzyme for certain enzyme catalysed reaction	K1,K2 & K3
CO4	Learn about the logistic and sensible entrapment technique to improve the state of enzyme immobilization	K3 & K4
CO5	Familiarize about the application of enzyme technology in industrial sector	K3 & K4

**Mapping with Programme Outcomes**

Cos	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**CONTENT:**

**Unit I – (15 Hrs.): Enzymology:** Introduction, Nomenclature and classification of enzymes by IUB system, enzyme characteristics, monomeric, oligomeric and multienzyme complex. Active site, models of enzyme action – lock and key and koshland induced fit model. Investigations of active site structure. Isoenzymes, abzymes and ribozymes. Enzyme units and enzyme turnover.

**Unit II – (15 Hrs.): Enzyme Kinetics:** MM Kinetics, LB plot, Eadie - Hofstee plot and Hanes-

woolf plot. Factors affecting enzyme activity (pH, temperature, substrate and enzyme concentration and activators) - Bisubstrate reactions - Enzyme inhibition- Reversible and irreversible. Feedback inhibition -Allosteric inhibition and regulation, concerted and sequential models for allosteric enzymes, positive and negative co-operativity with special reference to aspartate transcarbamoylase.

**Unit III – (15 Hrs.): Enzyme Catalysis & Coenzymes:** Acid-base catalysis, covalent catalysis and metal ion catalysis. Mechanisms of action of lysozyme, chymotrypsin, ribonuclease and carboxypeptidase. Metal activated enzymes and metalloenzymes. Coenzymes – TPP, PLP, FMN, FAD, NAD, NADP, CoA, Biotin and tetrahydrofolate.

**Unit IV – (15 Hrs.): Enzyme Technology:** Definition, types of immobilization – adsorption, covalent binding, entrapment, liposomes, cross linking and microencapsulation and application of immobilized enzyme. Biosensors- calorimetric biosensors, potentiometric biosensors, Amperometric biosensors, optical biosensors, Piezo-electric biosensors and immunosensors.

**Unit V – (15 Hrs.): Enzyme Purification and Applications:** Objectives and strategies of enzyme purification – source – methods of homogenization and separation based on size, polarity and binding sites – purification (Adenylate kinase from pig muscle). Enzymes as analytical agent, therapeutic agents and diagnostic reagents, Enzymes in industry like textile & leather industries and food industries.

#### TEXT BOOKS

1. Nicholas, C. Price, (1998). **Fundamentals of Enzymology**. 2<sup>nd</sup> Edition, Oxford University Press. UK
2. Trevor Palmer and Philip.L.Bonner (2008). **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>

## PEDOGOGY: CHALK and Talk , PPT

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

Paper : Core IV  
Hours/Week : 5  
Credit : 4  
Paper Code : 18P1BC04

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

**COURSE OUTCOMES:**

Course No	Coarse Outcome	Knowledge Level
CO1	To obtain the knowledge about the microscope handling and the basic difference between the ordinary microscope and electron microscope. Biosensor in detecting the presence of chemicals using a enzymes or antibodies	K1 & K2
CO2	To learn the chromatographic techniques for the separation of the individual compound from the mixture of compound.	K1 & K2
CO3	To study the interaction between matter and electromagnetic radiation and visible light dispersed according to its wavelength, by a prism.	K1, K2 & k3
CO4	Understood about the characterization of surfaces using radioisotopes generally involves observing the manner in which the radioactive species interact with the surface	K3 & K4
CO5	To obtain knowledge about the separation and analysis of macromolecules and their fragments, based on their size and charge.	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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.

**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, technique and applications of paper, Native PAGE gels, SDS-PAGE, Isoelectric focusing, Pulse field electrophoresis, Capillary electrophoresis, Immunoelectrophoresis.

**Unit III – (15 Hrs.): Chromatography:** General principles and definitions, Types, Principle, Instrumentation and application of Chromatography – Paper, Column, Thin layer chromatography, Ion- Exchange, Molecular sieve (gel filtration), Affinity, High-performance liquid chromatography (HPLC), Gas-liquid chromatography (GLC), FPLC.

**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, Molecular analysis using light scattering and Atomic absorption spectroscopy, Flame Photometry – principle, instrumentation and applications, Electron microscope – principle, instrumentation and application of SEM and TEM.

**Unit V – (15 Hrs.): Radioisotopes:** . X-ray diffraction - Principle, theory of operation and application, Circular dichroism (CD) – principles, theory of operation and applications, Radioisotopic techniques- Principle and applications of GM Counter, Liquid and Solid Scintillation Counter and autoradiography, applications of radioactive isotopes in biological research.

**TEXT BOOKS**

1. Veerakumari, L (2006). **Bioinstrumentation**, MJP Publishers, Chennai.
2. B.K. Sharma (2019). **Instrumental methods of chemical analysis**, Goel Publishing House, Meerut, 27<sup>th</sup> edition,
2. Avinash Upadhyay, Kakoli Upadhyay, and Nirmalendu Nath, (2009). **Biophysical Chemistry: Principles and Techniques**. 2009 Rev.edition, Himalaya publishing House, Mumbai.
- 4.Gurdeep, R. Chatwal, and Sham, K. Aanand, (2018). **Instrumental Methods of Chemical Analysis**. 5<sup>th</sup> edition, Himalaya publishing House, Mumbai.
- 5.Keith Wilson and John walker2017, Principles and techniques of biochemistry and molecular biology,7<sup>th</sup> edition published by Cambridge university press.

**REFERENCE BOOKS**

1. Keith Wilson, and John Walker, (2000). **Principles and Techniques of Practical Biochemistry**. 5th edition, Cambridge University Press. UK.
2. Wilson, K and Goulding, KH (1987). **A Biologist Guide to Principles and Tecniques of Practrical Biochemistry**, 3rd edition, Edward Arnold Publishers. London, UK.
3. West, E.S and Todd , W.R (1985), **Textbook of Biochemistry**, 4th edition MacMillan worth Publishers, Germany.

**WEB OF RESOURCE:**

1. [www.centrifugebybeckman.com](http://www.centrifugebybeckman.com)
2. [www.axis-shield-density-gradient-media.com/training-1new](http://www.axis-shield-density-gradient-media.com/training-1new).
3. <http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/radact.html>
4. [www.austincc.edu/.../](http://www.austincc.edu/.../)
5. <https://www.dnalc.org/resources/animations/gelectrophoresis.html>

**PEDOGOGY: CHALK and Talk , PPT**

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

Paper	: Core Biochemistry Practical I	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P1BCP01</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
4. Estimation of RNA
5. Isolation of lecithin from egg yolk.
6. Estimation of ascorbic acid from fruit
7. Estimation of lactose from milk
8. Separation of Amino acids, Sugars by Paper Chromatography (Ascending, Descending and Circular).
9. 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. (2005) **Biochemical Methods.** 2<sup>nd</sup> Edition. New Age International (P) Limited. New Delhi.

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

Paper	: Core Biochemistry Practical II	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P2BCP02</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. Immobilisation of peroxidase/Acid phosphatase by matrix entrapment, ionic and cross linking

III. Separation of Isoenzymes

7. Separation of LDH by SDS-PAGE

**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. (2005) **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 (2018-19)  
Core Practical - I**

Paper : Core Practical – I  
Examination : External  
Time : Six Hours  
Paper Code : **18P1BCP01** 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 (2018-19)  
Core Practical - II**

Paper : Core Practical – II  
Examination : External  
Time : Six Hours  
Paper Code : 18P1BCP02  
Maximum Marks : 60

**(Answer all the questions)**

1. a) Determine the Effect of Temperature on the activity of Peroxidase (25 Marks)  
(Or)  
b) Determine the Effect of pH on the activity of Alanine phosphatase
  
2. a) Perform Immobilisation of peroxidase by matrix entrapment methods (25 Marks)  
(Or)  
b) Determine the Effect of Substrate concentration on the activity of Alkaline phosphatase

RECORD : 10

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

**PART – A (20X 1=20 marks)**

**Multiple Choice Question From each unit 4 Questions**

**PART – B (5 X 5 = 25 marks)**

**Answer All Questions**

One Question from each unit with internal choice

**PART-C (3x10=30 marks)**

**Answer any three Questions**

One question from each unit

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2018-19)  
BIOPOLYMERS**

Paper	: Core Paper I		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P1BC01</b>	Maximum Marks	: 75

**Section A (Answer all the questions) (20x1=20)**

**1. The general formula of Carbohydrates is**

(A)  $C_nH_{2n}O_n$  (B)  $C_{2n}H_{2O_n}$  (C)  $C_nH_{2O_{2n}}$  (D)  $C_nH_{2n}O_{2n}$

**2. The Keto sugar is**

(A) Glycerose (B) Ribulose (C) Fructose (D) Dihydroxyacetone

**3. Polysaccharides are**

(A) Polymers (B) Acids (C) Proteins (D) Oils\

**4. The most important epimer of glucose is**

(A) Galactose (B) Fructose  
(C) Arabinose (D) Xylose

**5. A heteropolysaccharide among the following is**

(A) Inulin (B) Cellulose (C) Heparin (D) Dextrin

**6. An example of a saturated fatty acid is**

(A) Palmitic acid (B) Oleic acid (C) Linoleic acid (D) Erucic acid

**7. Molecular formula of cholesterol is**

(A)  $C_{27}H_{45}OH$  (B)  $C_{29}H_{47}OH$  (C)  $C_{29}H_{47}OH$  (D)  $C_{23}H_{41}OH$

**8. Sphingomyelins:**

(A) Phospholipids (B) Nitrolipids (C) Alcohols (D) None of these

**9. The end products of saponification:**

(A) glycerol (B) acid (C) soap (D) Both (A) and (C)

**10. All proteins contain the**

(A) Same 20 amino acids (B) Different amino acids (C) 300 Amino acids occurring in nature  
(D) Only a few amino acids

**11. Sulphur containing amino acid is**

(A) Methionine (B) Leucine (C) Valine (D) Asparagine

**12. An essential amino acid in man is**

(A) Aspartate (B) Tyrosine (C) Methionine (D) Serine

**13. Which of the following is a dipeptide?**

(A) Anserine (B) Glutathionen (C) Glucagon (D)  $\beta$  –Lipoprotein

**14. Vitamins are**

(A) Accessory food factors (B) Generally synthesized in the body (C) Produced in endocrine glands (D) Proteins in nature

**15. One manifestation of vitamin A deficiency is**

(A) Painful joints (B) Night blindness (C) Loss of hair (D) Thickening of long bones

**16. Vitamin K is found in**

(A) Green leafy plants (B) Meat (C) Fish (D) Milk

**17. In human body highest concentration of ascorbic acid is found in**

(A) Liver (B) Adrenal cortex (C) Adrenal medulla (D) Spleen

**18. A nucleoside consists of**

(A) Nitrogenous base (B) Purine or pyrimidine base + sugar (C) Purine or pyrimidine base + phosphorous (D) Purine + pyrimidine base + sugar + phosphorous

**19. RNA does not contain**

(A) Uracil (B) Adenine (C) Thymine (D) Ribose

**20. The major catabolic product of pyrimidines in human is**

(A) Alanine (B) Urea (C) Uric acid (D) Guanine

**Section-B Answer all the Questions**

**(5x5=25 Marks)**

21.(a)Discuss about the Polysaccharides? (Or)

(b)What are Proteoglycans? Explain.

22.(a)Classify the Protein with examples.(Or)

(b)Explain about the Ramachandran Plot?

23. (a)What are sterols? Explain about plant sterols.(Or)

(b)Classify the Lipoproteins and explain its composition.(Or)

24. (a)Write the structures of nucleotides? (Or)

(b)Describe the DNA histone proteins?

25.(a)Explain about nucleic acid binding proteins?(Or)

(b)Write the biological properties of vitamins.

**Section-C**

**(3x10=30 Marks)**

**Answer Any 3 Question**

26.Discuss briefly about bacterial cell wall polysaccharides? (Or)

27.Explain about amino acid sequencing ? (Or)

28.Explain the transport and hydrolysis of triglycerol ? (Or)

29.Discuss the structure of nitrogenous bases? (Or)

30.Explain the structure, requirement, deficiency and anti oxidant properties of water soluble vitamins?

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

**MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2018-19)  
CELLULAR BIOCHEMISTRY**

Paper	: Core Paper II		
Examination	: External	Section – A (5X5) :25	: 25
Time	: Three Hours	Section – B (5X10):50	: 30
Paper Code	: 18P1BC02	Maximum Marks :75	: 75

**Section A (Answer all the questions) (20x1=20)**

- 1. What make parts of the endoplasmic reticulum rough? The presence of**  
A) budding vesicles B) proteins in the membrane C) ribosomes D) glycosylation intermediate filaments
- 2. Which of the following is a feature found in BOTH prokaryotic and eukaryotic cells**  
A) extensive array of intermediate filaments B) multiple linear chromosomes in each cell C) ribosomes that accomplish protein synthesis D) mitotic spindles that partition chromosomes into the daughter cells E) All of the above are found in both types of cells.
- 3. The proteins that make up the electron transport chain in animals are located**  
A) on the outer mitochondria membrane B) on the inner mitochondria membrane C) in the mitochondria matrix D) in the cytoplasm E) in the nucleus
- 4. What is the key event that leads to association of a protein with a proteasome?**  
A) phosphorylation B) acetylation C) glycosylation D) ubiquitination E) methylation
- 5. Which of the following would INHIBIT the onset of mitosis?**  
A) binding of M Cyclin to Cdk B) phosphorylation of Cdk by Wee1 C) phosphorylation of Wee1 by Cdk D) dephosphorylation of Cdk by Cdc25 E) None of the above
- 6. Which of the following processes during animal cell division is not mediated by microtubules?**  
A) Movement of the chromosomes to the poles of the cell B) Movement of the chromosomes to the metaphase plate C) Contraction of the cleavage furrow D) Positioning of the cleavage furrow E) Separation of the centrosomes
- 7. Dye injected into an epithelial cell might be able to enter an adjacent cell through a**  
A) tight junction B) microtubule C) desmosome D) adherence junction E) gap junction
- 8. Which of the following is NOT a change experienced by a typical cell committing to apoptosis?**  
A) Loss of mitochondrial membrane functions B) Cytoskeleton collapses C) DNA breaks into fragments D) Cell swells and ultimately bursts E) Nuclear envelope disassembles
- 9. When ATP binds to the head of myosin II it promotes:**  
A) binding of myosin to a new actin subunit B) pivoting of the myosin head and generating movement C) release of actin D) formation of myosin filaments E) none of the above
- 10. Which of the signaling receptors are/is generally activated by dimerization and induce binding to two sites on their ligand?**  
A) Gated ion channels B) G protein-coupled receptors C) Receptor tyrosine kinases D) Steroid hormone receptors E) All of the above
- 11. Death or mental retardation takes place if accumulation happens in**  
a. somatic cells b. brain cells c. meristematic cells d. sensory cells
- 12. In a normal human being number of chromosomes is**  
a. 23 b. 46 c. 53 d. 26
- 13. Pigments containing bodies which are bounded by membrane are called**  
a. Plastids b. chlorophyll c. chloroplast d. hemoglobin
- 14. In word Lysosoma, 'lyso' means splitting and 'soma' means**  
A. cell b. body c. tissue d. organic

**15. Phagocytosed food is digested with help of enzymes which are present in**

a. ribosome b. lysosomes c. mitochondria d. Golgi complex

**16. Cell was discovered by**

a. Leeuwenhoek, b. Robert Hooke, c. Robert Swanson, d. Robert Brown

**17. A genophore (nucleoid) consists of**

A. Histone and RNA B. A single double stranded DNA C. A single stranded DNA D. Histone and non-histone

**18. Plasmodesmata are located in narrow areas of \_\_\_\_\_.**

A. Cell walls B. Protoplasm C. Cellulose D. Nuclei

**19. What do prokaryotic cells lack?**

A. Cell membrane b. Cytoplasm Cell wall membrane-bound nucleus

**20. Which one of the following organelles digests the old organelles that are no longer useful to the cells?**

A. Ribosomes B. Mitochondria C. Lysosomes D. Chromatin

**Section-B Answer all the Questions (5x5=25 Marks)**

21.(a) Discuss about the cell division? (Or)

(b) Write note on phases of cell cycle?

22.(a) Explain about actin filament? (Or)

(b) Explain the morphology of mitochondria?

23.(a) Write the overview of cell-cell interaction? (Or)

(b) Explain about cadherins.

24.(a) Write about molecular diagnosis of cancer? (Or)

(b) Explain the tumour repressor genes

25. (a) Explain the bacteriorhodopsin. (Or)

(b) Describe symporters with example?

**Section-C (3x10=30 Marks)**

**Answer Any 3 Question**

26. Explain in brief about the membrane proteins and its types?

27. Explain the morphology and functions of chloroplast and peroxisomes

28. Explain about signaling molecules and their receptors?

29. Explain the tumour virus

30. Discuss the transport of glucose in to the membrane

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2018-19)  
ADVANCED ENZYMOLOGY**

Paper	: Core Paper III		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 30
Paper Code	: <b>18P1BC03</b>	Maximum Marks	: 75

**Section A (Answer all the questions) (20x1=20)**

- 1. The term 'Enzyme' was first coined by**  
a) Tswett b) Kuhne c) Tiscelius d) Michaelis
- 2. Non Protein part of the enzyme is called**  
a) Apoenzyme b) Holoenzyme c) Prosthetic group d) Isoenzyme
- 3. Protein part of an enzyme is called**  
a) Holoenzyme b) Apoenzyme c) Metalloenzyme d) Abzyme
- 4. Lock and Key hypothesis was proposed by**  
a) Koshland b) Emil Fischer c) Michaelis d) Eaidee Hofstee
- 5. The amount of energy required to start a chemical reaction is called**  
a) Kinetic energy b) Activation Energy c) Potential Energy d) Internal Energy
- 6. Km Value refers to**  
a) Maximum velocity reaction b) Threshold Value c) Near Maximum Velocity d) One of the maximum reaction velocity
- 7. The pH optima of most of the enzymes is**  
a) Between 2 and 4 b) Between 5 and 9 c) 8 and 12 d) Above 12
- 8. In enzyme kinetics, VMax reflects**  
a) The amount of an active enzyme b) Substrate Concentration c) Half the substrate concentration d) Enzyme Substrate Complex
- 9. Competitive Inhibitors tend to**  
a) Decrease the Km b) Decrease the VMax c) Increase the Km d) Increase the VMax
- 10. Feedback inhibition of enzyme action is affected by**  
a) Enzyme b) Substrate c) End products d) None of these
- 11. Allosteric enzymes contain**  
a) Multiple subunits b) Single chain c) Two chains d) Three chains
- 12. Multiple forms of the same enzyme are known as**  
a) Zymogens b) Isoenzymes c) Proenzymes d) Pre-enzymes.
- 13. An example of group transferring Coenzyme is**  
a) NAD<sup>+</sup> b) NADP<sup>+</sup> c) FAD d) CoA
- 14. Coenzyme A contains a Vitamin which is**  
a) Thiamin b) Ascorbic Acid c) Pantothenic Acid d) Niacinamide
- 15. Pyruvate Dehydrogenase Complex is located in**  
a) Cytosol b) Lysosomes c) Mitochondria d) Endoplasmic Reticulum
- 16. The tear secretion contains an antibacterial enzyme known as**  
a) Zymase b) Diastase c) Lysozyme d) Lipase
- 17. The immobilized enzyme used in the manufacture of fructose syrup is**  
a) Chymotrypsin b) Asparaginase c) Glucose Isomerase d) Lipase
- 18. The industrially important enzyme used for washing cotton fabrics contaminated with dirt and soil particles is**  
a) Protease b) Cellulase c) Amylase d) Catalase

**19. The clinically important enzyme used for clearing the blood clots is**

- a) Asparaginase b) Streptokinase c) Acid Phosphatase d) Oxidase

**20. Enzyme catalyses a reaction in**

- a. Forward direction b. Backward direction c. Bothway d. Either ways

**Section-B Answer all the Questions (5x5=25 Marks)**

21.(a)Write the factors affecting enzyme activity? (Or)

(b)Explain the types of Isoenzymes.

22.(a)What is acid-base catalysis? (Or)

(b)Explain about metal activated enzymes.

23.(a)What are allosteric enzymes? (Or)

(b)Define LB plot.

24.(a)Write the applications of MCA's? (Or)

(b)What are anticoagulants?

25. (a)Discuss about the enzymes as thrombolytic agents? (Or)

(b)Write the uses of enzymes in Pharmaceutical industries?

**Section-C (3x10=30 Marks)**

**Answer Any 3 Question**

26.(a)Explain the classification of enzymes with examples.

27.(a)Write the mechanism of reaction catalysed by lysozyme and chymotrypsin.

28.(a)Describe the bisubstrate reaction.

29.(a)What are biosensors? Explain its types.

30.(a)Describe the enzymes as analytical reagents?

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

**MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER I (2018-19)  
ANALYTICAL BIOCHEMISTRY**

Paper	: Core Paper IV		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10):	50 : 30
Paper Code	: <b>18P1BC04</b>	Maximum Marks	: 75 : 75

**Section A (Answer all the questions) (20x1=20)**

- 1) The Importance of *invivo* studies were described by**  
a) Harry smith b) Louis Pasteur c) Christopher Hopkins d) none above
- 2) *Invitro* is also known as**  
a) Test tube experiments b) Beaker experiments c) Animal Experiments d) All the above
- 3) Homogenisation in biology is often followed by**  
a) cell sorting b) cell counting c) Cell lysis d) All the above
- 4) In cryopreservation the frozen cells are kept for storage at the temperature range of**  
a) -60 to -180 b) -80 to -200 c) -70 to -196 d) -50 to -146
- 5) Preparative ultra centrifuges are capable of spinning rotar to a maximum speed of**  
a) 8,00,000 RPM b) 8000 RPM c) 800 RPM d) 80,000RPM
- 6) The vertical tube rotar is a fixed angle of**  
a) 45° b) 0° c) 60° d) 80°
- 7) Swinging bucket rotar, the given test tube is parallel to the applied**  
a) Gravitational force b) Centrifugal force c) Nuclear forced d) none of the above
- 8) Paper chromatography was used by**  
a) Martin consden and Gordon b) Christopher Lipinski c) Andrew Hopkins d) All the above.
- 9) TLC is used in teh separation of**  
a) High Molecular weight compound b) Low Molecular weight compound c) Both a And b d) None above.
- 10) Adsorption chromatography was first developed by**  
a) D.T.Day b) Harry Smith c) M.S.Tswet d) Both (a) and (b)
- 11) Paper electrophoresis is a type of**  
a) Gel Electrophoresis b) Zone electrophoresis c) Affinity electrophoresis d) None above.
- 12. The instrument which measure the intensity of the colour**  
a) Colorimeter b) Speedometer c) Centrifuge d) Photometer
- 13. The Instrument which measures based on the intensity of light is**  
a) Colorimeter b) Flame Photometer c) Spectrometer d) Centrifuge
- 14) The flourimeters are arranged in an degree of**  
a) 60° b) 45° c) 90° d) 150°
- 15) In spectrophotometry the UV light measuring light absorption is**  
a) ~200 to ~ 400 nm b) ~ 400 to ~900 nm c) ~300 to ~500 nm d) None above
- 16) The Unit of Radioactivity is**  
a) Volt b) Curie c) Watt d) Ampere
- 17) In negatron emission, the neutron gives**  
a) Negatron, Proton b) Proton, Electron c) Neutron, Positron d) None above
- 18) The word isotope was introduced in the year**  
a) 1915 b) 1920 c) 1913 d) 1925.

19) Positron emission results in a loss of

- a) Neutron b) Proton c) Electron d) Negatron

20) The ----- is an instrument used for measuring ionizing radiation used widely in applications such as radiation dosimeter.

- a) Scintillation counter B) GM Counter c) Centrifuge d) Spectrometer

**Section-B Answer all the Questions (5x5=25 Marks)**

21.(a)Write the biochemical buffers? (Or)

(b)What are the uses of liquid nitrogen in cell disruption.

22.(a)Write the types of centrifuges and rotors? (Or)

(b)Explain about capillary electrophoresis.

23.(a)What is paper chromatography? Explain.(Or)

(b)Explain the principles of Affinity chromatography.

24.(a)Write the applications of UV-Visible spectrophotometer.(Or)

(b)Define ESR.

25.(a)Explain the principles and applications of CD? (Or)

(b)Discuss the units of radioactivity.

**Section-C (3x10=30 Marks)**

**Answer Any 3 Question**

26.Explain briefly about oxygen electrode.

27.Define analytical ultracentrifugation.

28.Explain gas-liquid chromatography?

29.Explain Mass spectrometry.

30.Explain in detail about X-ray diffraction.

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

**PART – A (20X 1=20 marks)**

**Multiple Choice Question From each unit 4 Questions**

**PART – B (5 X 5 = 25 marks)**

**Answer All Questions**

One Question from each unit with internal choice

**PART-C (3x10=30 marks)**

**Answer any three Questions**

One question from each unit

.

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

Paper	: Core V	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>18P2BC05</b>	External	: 75

**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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Understand how the glycolytic pathway is used to convert glucose to pyruvate and understand conservation of chemical potential energy in the form of ATP and NADH.	K1 & K2
CO2	understand the fate of pyruvate under aerobic and anaerobic conditions and the amphibolic nature of TCA cycle	K1 & K2
CO3	Understand the concepts of metabolism of carbohydrates.	K1,K2 & k3
CO4	Understand the concepts of metabolism of lipids.	K3 & K4
CO5	Understand the concepts of metabolism of protein, amino acid and nucleic acid.	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	M	S	S
CO3	S	S	S	S	S

S- Strong; M-Medium; L-Low

**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 / glycerophosphate 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 leucotrienes, 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.): Porphyrin Metabolism:** Regulation, biosynthesis and degradation of Hb, chlorophyll and cytochrome, Nucleic acid metabolism - Biosynthesis and degradation of purine and pyrimidines (De novo 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.

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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.
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<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>

**PEDOGOGY: CHALK and Talk , PPT**

**MOLECULAR BIOLOGY**

Paper	: Core VI	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>18P2BC06</b>	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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Course will advance the understanding of various signaling components and their functions.	K1 & K2
CO2	Students will truly understand the nuclear receptor mediated signaling mechanism and its regulation	K1 & K2
CO3	Advancement in knowledge in the field of G protein coupled signal transmission and its regulation	K1, K2 & k3
CO4	Thorough understanding of signaling Pathways that controls gene activity	K3 & K4
CO5	Understanding in signal integration and gene controls	K4 & K5

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

**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 - Hill companies, Inc India.

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## PEDOGOGY: CHALK and Talk , PPT

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

Paper : Elective I  
Hours/Week : 5  
Credit : 3  
Paper Code : 18P2BCE01

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Understand the basic classification of Hormones	K1 & K2
CO2	Understand the structure synthesis, degradation of hormones	K1 & K2
CO3	Describe the metabolic aspect of hormones	K1, K2 & k3
CO4	Illustrate the signal transduction process	K3 & K4
CO5	Describe the various types of receptor fro secreted molecules	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

**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.

**REFERENCE BOOKS**

1. Foye, O.W., Lemke, J.L. and William D.A. (1995), **Medicinal Chemistry**, B.I. Waverly Pvt. Ltd., New Delhi.
2. West, E.S., Todd, W.R., Mason, H.S. and Van Brugge, T.J. (1966), **Biochemistry**. 4<sup>th</sup> Edition, The Macmillan Company, London.

**WEB OF RESOURCE:**

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[www.medicinenet.com](http://www.medicinenet.com) › ... › thyroid az list › medterms medical dictionary az list

[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)

**PEDOGOGY: CHALK and Talk , PPT**

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

Paper : Core VII  
Hours/Week : 5  
Credit : 4  
Paper Code : 18P2BC07

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

Course No	Coarse Outcome	Knowledge Level
CO1	To obtain the knowledge of the immune system is a host defense system comprising many biological structures and processes within an organism that protects against disease.	K1 & K2
CO2	To concentrate on the antigen and antibody reactions and immunological techniques.	K1 & K2
CO3	Understanding about the two branches of immune system such as humoral immunity and cellular immunity, cytokines and complement system.	K1, K2 & k3
CO4	Clear about the hypersensitivity reaction or intolerance with undesirable reactions produced by the normal immune system, including allergies and	K3 & K4
CO5	To obtain the knowledge about the hybridoma technology is to produce large numbers of identical antibodies (also called monoclonal antibodies) and a recombinant DNA technology that involves inserting the DNA encoding an antigen that stimulates an immune response.	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

**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**

1. Tizard(1984). **An Introduction Immunology**: Tizard K, Saunders college Publishing
2. Immunology Roitt. Brostoff and David(1998). **Immunology**, 4<sup>th</sup> Edition, Mosby Times Mirror Int Pub Ltd.
3. KubyRichard, (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
5. Janeway Jr.Paul., (2001). **The Immune System in Health and Disease**. Travels and Co.,

**REFERENCE BOOKS**

1. KubyRichard, (2000). **Immunology**, 4<sup>th</sup> Edition, W.H. Freeman and Company, New York.
2. Stites D.P. Stobo, J.D.Fundanberg. H.A and Wells. J.V. (1990) **Basic and Clinical Immunology**. 6<sup>th</sup> Edition Los AtlasLange.
- 3 Charles. A.Janeway, (1994). J.R. Paul **Immunology** 4<sup>th</sup> Edition. Black well Scientific Publishers,
4. Virella, (1999)**Introduction to Medical immunology** 4<sup>th</sup> Edition, , Marcel Dekker Ltd.,

**WEB OF REFERENCE:**

[www.microbiologybook.org/mayer/ab-ag-rx.htm](http://www.microbiologybook.org/mayer/ab-ag-rx.htm)

[www.ebi.ac.uk/interpro/potm/2005\\_2/Page1.htm](http://www.ebi.ac.uk/interpro/potm/2005_2/Page1.htm)

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

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

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

**PEDOGOGY: CHALK and Talk , PPT**

**PLANT BIOCHEMISTRY AND PLANT BIOTECHNOLOGY**

Paper	: Elective – I	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 3	Internal	: 25
Paper Code	: 18P2BCE02	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.

Course No	Coarse Outcome	Knowledge Level
CO1	To obtain the knowledge of the state the importance of photosynthesis, factors affecting photosynthesis, the photosynthetic pigment, and describe the biochemistry of photosynthesis.	K1 & K2
CO2	To make the students understand the components of culture media and various tissue culture techniques. Learnt about the technique of genetic	K1 & K2
CO3	Define respiration and itemize detailed processes of cell respiration and gaseous exchange in flowering plants;	K1,K2 & k3
CO4	Clear about the list and describe the features of phloem translocation	K3 & K4
CO5	To obtain the knowledge about plant and animal tissue culture methods, mechanism of gene transfer Methods of selection, Production of novel proteins and their applications.	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	S	S	S
CO3	S	M	S	S	S
CO4	S	M	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

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

#### REFERENCE BOOKS

- 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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1. [www.biology4kids.com/files/plants\\_photosynthesis.html](http://www.biology4kids.com/files/plants_photosynthesis.html)
2. [www.slideshare.net/BiologyIB/photosynthesis-powerpoint-3983595](http://www.slideshare.net/BiologyIB/photosynthesis-powerpoint-3983595)
3. [http://www.slideshare.net/shivam\\_hayabusa/production-of-secondary-metabolites](http://www.slideshare.net/shivam_hayabusa/production-of-secondary-metabolites)
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5. <https://en.wikipedia.org/wiki/Photophosphorylation>

**PEDOGOGY: CHALK and Talk , PPT**

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

Paper	: Core Practical III	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P3BCP03</b>	External	: 60

**I. PHYTOCHEMICAL ANALYSIS**

1. Qualitative analysis of secondary phytochemicals in medicinal plants
2. Estimation of chlorophyll in leaves
3. Determination of aldehydes in lemon oil
4. Extraction and confirmation
  - a. Pectin from orange peel
  - b. Caffeine from tea
  - c. Solanine from potato

**II. PLANT TISSUE CULTURE (DEMO)**

1. Sterilization and media preparation
2. Callus Induction and micro propagation
3. Isolation of protoplasts
4. Protoplast Culture
5. Anther culture
6. Somatic Embryogenesis

**III QUANTITATIVE ANALYSIS**

1. Estimation of total alkaloids
2. Estimation of total phenols
3. Estimation of total flavonoids
4. Estimation of Phytosterols

**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 I – SEMESTER II  
CORE PRACTICAL – IV**

Paper	: Core Practical II	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P4BCP04</b>	External	: 60

**IMMUNOLOGY**

1. Estimation of DNA Diphenylamine method
2. Estimation of RNA Orcinol method
3. Agarose Gel Electrophoresis
4. Isolation of plasmid DNA
5. Isolation of Genomic DNA
6. Isolation of RNA
7. Restriction digestion of DNA
8. Preparation of competent cell and Transformation
9. PCR – Demonstration
10. Southern Blotting –Demonstration

**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 (2018-19)  
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>18P2BC05</b>	Maximum Marks : 75	: 75

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

**1. Study of relationship of energy and transformation of energy in living organisms is known as**

(a) catabolise energetic (b) anabolic energetic (c) broken energetic (d) bioenergetics

**2. Which out of the following has the highest redox potential?**

a) NAD b) FMN c) FAD d) O<sub>2</sub>

**3. Loss of hydrogen atoms from a molecule results in**

(a) loss of electron (b) gain of electrons (c) gain of protons (d) gain of neutrons

**4. Which one out of the following is not a NAD<sup>+</sup> requiring enzyme?**

a) Lactate dehydrogenase b) Pyruvate dehydrogenase complex  
c) Maltate dehydrogenase d) Acyl co-A dehydrogenase

**5. Which type of metabolic fuel is utilised for generating glucose under conditions of severe starvation?**

(a) glycogen (b) fat (c) starch (d) amino acid.

**6. Simplest carbohydrate is ....**

a) Dihydroxy acetone b) Glycerldehyde c) Glucose d) Gulose

**7. The under mentioned compound is an acid mucopolysaccharide....**

a) Dicumarol b) EDTA c) Hyaluronic acid d) Glycoge

**8. The carrier of citric acid cycle is -----**

(a) succinate (b) fumarate (c) malate (d) oxaloacetate

**9. The key regulatory enzyme of cholesterol synthesis is -----**

(a) HMG Co A synthase (b) HMG Co A lyase  
(c) HMG Co A reductase (d) Mevolanate kinase

**10. The dietary fat are transported as -----**

(a) micelles (b) chylomicrons (c) fatty acid albumin complex (d) liposomes

**11. Which of the following is not used for fatty acid synthesis?**

(a) Cobalamine (b) NADPH (c) Biotin (d) Bicarbonate

**12. The key enzyme for the utilization of ketone bodies is -----**

(a) thiolase (b) thiophorase (c) thiokinase (d) thioesterase

**13. 3-phosphoglycerate is not the metabolic precursor for**

a) Serine b) Glycine c) Cysteine d) Arginine

**14. The cyclized derivative of glutamate is**

a) Proline b) Arginine c) Glutamine d) Serine

**15. Phosphoribosyl pyrophosphate is a precursor of tryptophan and**

a) Tyrosine b) Histidine c) Phenylalanine d) Isoleucine

**16. Which of the following is not an aromatic amino acid?**

a) Phenylalanine b) Tyrosine c) Tryptophan d) Leucine

**17. Acquired porphyria is due to -----**

(a) Hg (b) Pb (c) Cu (d) Sn

**18.Heme synthesis happens in -----**

- (a) cytoplasm (b) mitochondria (c) both (d) none

**19.Which is not a hemoprotein?**

- (a) catalase (b) tryptophan pyrrolase (c) neuroglobin (d) adenylate kinase

**20.Single letter code of pyrrolysine is -----**

- (a) B (b) J (c) O (d) U

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

21. a) Write a short notes on high energy phosphate (Or)

- b) Describe malate-Asparatate shuttle system.

22. a )Glycolysis (Or)

- b) Glyoxalate pathway

23. a) Explain alpha oxidation of Fattyacid (Or)

- b) Write the synthesis of TAG and phosphatidyl choline

24. a)Explain transamination and decarboxylation (Or)

- b) Describe the synthesis of epinephrine and nor epinephrine

25. a)Write a notes on biosynthesis of Hb (Or)

- b)Write about the regulation of pyrimidine biosynthesis

**Section-C (Answer any 3 Questions)**

26. Write a short notes on oxidative phosphorylation

27. TCA cycle and its regulation

28. Write about beta oxidation of palmitic acid and calculate the energetics

29. Describe Urea cycle and its regulation

30. Describe about denovo synthesis of purines

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Molecular Biology**

Paper	: Core Paper VI		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P2BC06</b>	Maximum Marks :	: 75

**Section A (Answer all the questions) 20X1=20**

1. Which of the following enzymes is the principal replication enzyme in E. coli?  
a) DNA polymerase I b) DNA polymerase II c) DNA polymerase III d) None of these
2. The enzyme used to join bits of DNA is  
a) DNA polymerase b) DNA ligase c) Endonuclease d) Primase
3. Eukaryotes differ from prokaryote in mechanism of DNA replication due to  
a) Use of DNA primer rather than RNA primer b) Different enzyme for synthesis of lagging and leading strand c) Discontinuous rather than semi-discontinuous replication d) Unidirectional rather than semi-discontinuous replication
4. Which of the following process occurs between DNA molecules of very similar sequences?  
a) Homologous genetic recombination b) Site specific recombination c) Non-homologous recombination d) Replicative recombination
5. In bacterial promoters, which of the following describes the 'Pribnow box'?  
a) The 5' untranslated region b) The -10 box c) The -35 box d) The termination sequence
6. Which of the following statements about mRNA splicing is true?  
a) The existence of split genes has no advantage b) Self-splicing introns do not require the help of any protein for splicing to occur accurately c)  $\beta$ -thalassaemia results from a genetic defect in the spliceosome d) Splicing occurs in the cytosol
7. The role of the sigma factor in bacterial RNA polymerase is  
a) to catalyse RNA synthesis b) to position RNA polymerase correctly on the template DNA c) to terminate RNA synthesis d) to unwind the DNA template
8. Which of the following does the abbreviation TBP stand for?  
a) TATA-box binding protein b) Transcription associated factor c) Transcription factor binding protein d) TATA box polymerase
9. How many t-RNAs are required to translate all 61 codons?  
a) 31 b) 32 c) 30 d) 29
10. Which position of a codon is said to wobble?  
a) First b) Second c) Third d) Fourth
11. In prokaryotes, the first amino acid in the polypeptide chain is  
a) Methionine b) N-methyl methionine c) N-formyl methionine d) All of these
12. eRF1 is the release factor in eukaryotes that require  
a) ATP for its binding to ribosome b) GTP for its binding to ribosome c) ATP and GTP for its binding to ribosome d)  $Mn^{2+}$  for its binding to ribosome
13. Which of the following is not a type of post translational modification?  
a) Proteolysis b) Protein folding c) Glycosylation d) Lipid addition

14. The first step in protein targeting is \_\_\_\_\_
  - a) Synthesis of protein
  - b) Translocation to Golgi body
  - c) Translocation to nucleus
  - d) Translocation to ER
15. The sequence of the structural gene in lac operon is
  - a) lacZ-lacA-lacY
  - b) lacA-lacY-lacZ
  - c) lacZ-lacY-lacA
  - d) lacA-lacZ-lacY
16. The trp operon is a
  - a) Positively repressible operon
  - b) Positively inducible operon
  - c) negatively repressible operon
  - d) negatively inducible operon
17. Which of the following mechanisms will remove uracil and incorporate the correct base?
  - a) Direct repair
  - b) Base excision repair
  - c) Mismatch repair
  - d) Nucleotide excision repair
18. DNA polymerase enzyme involved in mismatch repair system of E.Coli is
  - a) DNA Pol-I
  - b) DNA Pol-II
  - c) DNA Pol-III
  - d) DNA Pol- $\beta$
19. In SOS repair system cleavage of LexA and UmuD is mediated by \_\_\_\_\_
  - a) RecB
  - b) RecA
  - c) RecC
  - d) UvrA
20. What are the two proteins which creates site specific recombination?
  - a) DNA topoisomerases and Spo11
  - b) DNA gyrase
  - c) DNA ligase
  - d) DNA helicase

**Section B (Answer all the questions) 5X5=25**

21. a) Write a short notes on Messelson and Stahl experiment (Or)
  - b) Describe about retrovirus.
22. a) Explain the mechanism of Group I splicing (Or)
  - b) Write about inhibition of transcription
23. a) Explain Wobble hypothesis (Or)
  - b) Write about activation and initiation of protein synthesis.
24. a) Explain about glycosylation process in protein targeting (Or)
  - b) Describe Lac operon.
25. a) Write a notes on DNA damage (Or)
  - b) Write about the nucleotide excision repair.

**Section-B (Answer any 3 Questions) 3X10= 30**

26. Explain the mechanism of replication in prokaryotes
27. Write a short on Ribozymes
28. Write about genetic feature of genetic code
29. Describe Trp operon
30. Describe about SOS repair system

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Endocrinology**

Paper	: Core Paper VII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P2BC07</b>	Maximum Marks : 75	: 75

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

- 1. Which of the following hormones is not important in calcium homeostasis?**  
a) Calcitonin b) parathyroid c) Glucagon d) Insulin
- 2. Which is Chemical Messenger**  
a) Glucose (b) CAMP (c) fructose d) Fructose kinase
- 3. ----- Controls substrate degradation in feed Back**  
a) Product (b) Intermediate (c) Both a & b d) second messengers
- 4. Which second messenger signals the release of Ca<sup>++</sup> from the endoplasmic reticulum?**  
a) 1,2 diacyl glycerol b) Inositol triphosphate c) CAMP d) ATP
- 5. what exerts control over the pituitary gland**  
a) Medulla b) Hypothalamus (c) cortex d)
- 6. oxytocin controls**  
a) labor b) puberty (c) both a & b d) lactation
- 7. Growth factors are**  
a) monomeric protein b) oligomeric protein (c) Protein d) Nucleic acids
- 8. Somatomedin promote**  
a) cell growth (b) osmosis (c) chromosome condensation d) cell destruction
- 9. What are the two main hormones secreted by Thyroid gland?**  
a) T3 b) T4 (c) calcitonin d) both a & b
- 10. What are the symptoms of release of too much T3 and T4 hormones?**  
a) anxiety b) coma (c) pigmentation d) Scurvy
- 11. The symptoms of hypothyroidism are:**  
a) Dry skin and hair b) Depression (c) both a & b d) pellagra
- 12. Melatonin Produced by**  
a) pineal gland (b) pituitary (c) pancreas Adrenal medulla
- 13. beta cell of pancreas produces**  
a) androgens (b) glucagon (c) endorphins d) Insulin
- 14. Type 2 diabetes characterised by**  
a) destruction of alpha cells (b) destruction of beta cells (c) loss of adrenal gland d) blood disorder
- 15. ----- is catecholamine**  
a) Dopamine (b) endorphins (c) uridine d) CAMP
- 16. Neuro hormone includes**  
a) oxytocin (b) Dopamine (c) None a & b d) thyroid hormones
- 17. Follicle stimulating hormone (FSH) is primarily responsible for \_\_\_\_\_.**  
a) ovulation (b) Spermatogenesis (c) Testosterone production d) lactation
- 18. Which of the following is part of spermatogenesis**  
a) mitosis b) meiosis (c) cell lysis d) both a & b

**19.-----is related to lactation**

- a) oxytocin (b) Vasopression (c)FSH d)Androgens

**20.-----causes testosterone deficiency**

- a) Hyogonadism b) vasopressin c) low concentration of glucose d)oxytocin

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

21.a )Discuss cAMP as second messenger (Or)

- b) Explain mechanism of action of steroid hormone

22.a)Draw a structure of pituitary gland (Or)

- b)Write a note on oxytocin and vasopressin

23.a) Describe the physiological role of parathyroid hormone (Or)

- b)Describe about pathophysiology of parathyroid hormone

24.a)Write the structure and physiological role of insulin (Or)

- b)Write about endorphins

25.a)Write a short notes on androgen (Or)

- b) Describe about steroid ovarian hormones

**Section-C (Answer any 3 Questions)**

26. Give an account of neuroendocrine integration in homeostasis

27. Write a short notes on hypothalamic hormone

28. Write in detail about Thyroid hormones

29. Write in detail about glucagon and somatostatin

30. Write a short notes on androgen

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Immunology and Immunotechnology**

Paper	: Core Paper VIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 18P2BC08	Maximum Marks : 75	: 75

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

- 1. Response of passive immunity is**  
a) Slow b).gradual, c) immediate, d)hard
- 2. Immunity which is achieved by introduction of antigen artificially in body is called**  
a) Active immunity, b) passive immunity, c) artificially induced immunity, d) auto-immunity
- 3. Serum which contains antibodies is called**  
a) Antigens, b) antiserum c) antibodies ,d) globulin
- 4. In case of tissue transplant, effect by which antigens reject foreign tissues is called**  
a) Auto-response b) cell-mediated response, c) tissue-oriented response ,d) manual response
- 5. If a person receives polio vaccination he would become immune against**  
a) small pox b) polio c) mumps ,d ) measles
- 6. What is another term for lymphatic nodules?**  
a). Lymph follicle, b) White pulp, c) Peyer's patches, d )Lymph node
- 7. Which layer of the gastrointestinal tract contains the gut associated lymphatic tissue?**  
a) Mucos b) Sub mucosa c) Muscularis externa ,d) Serosa
- 8. What is the acronym for the diffuse lymphatic tissue found in the intestinal tract?**  
a) BALT b) DALT, c) FALT ,d) GALT
- 9. Where do T lymphocytes gain their immunocompetence?**  
a) Thymus ,b) Thyroid, c) Bursa of Fabricus, d) Bone marrow
- 10. B Cells are activated by**  
a) Complement, b) Antibody, c) Interferon ,d) Memory cells e) Antigen
- 11. Monoclonal antibodies recognize a single:**  
a )Antigen , b) Bacterium ,c) Epitope, d) B cell e) Virus
- 12. Which hypersensitivity reactions are T cell mediated?**  
a)Type I , b)Type II, c)Type III , d) Type I, e) None of these
- 13. Which of the following bind to mast cells and cross-link, resulting in de-granulation and release of histamine?**  
a) IgM b) IgA , c)IgG, d) Interleukin, e) IgE
- 14. Which of the following is considered an autoimmune disease?**  
a). rheumatoid arthritis, b) AIDS , c) SCID ,d) agammaglobulinemia, e) CJD
- 15. A transplant between individuals of different animal species is termed as:**  
a) Allograft, b) isograft, c) enterograft, d) endograft, e) xenograft
- 16. HIV has a high mutation rate due to the imprecise operation of its:**  
a) Viral membrane, b) CD4 receptor, c ) Reverse transcriptase , d) protease ,e) dismutase
- 17. Which disease would be most similar to AIDS in its pathology?**  
a) SCID , b) DiGeorge Syndrome, c) Agammaglobulinemia, d) ADA deficiency , e ) Kuru
- 18. Human immunodeficiency virus (HIV) binds specifically to which immune cell marker?**

- a) CD8, b) MHC c) CDC, d) CD4

**19. Production of auto-antibodies may be due to:**

- a) Emergence of mutant clones of B cells, b) Production of antibodies against sequestered, (hidden) tissues, c) genetic factors d) all are possible

**20 .Theoretically, type..... blood can be donated to all persons because it lacks.....**

- a) O/antigens, b) AB/ antibodies ,c) A/ antibodies, d) O/antibodies, e) A/IgE

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

21. a) Define hematopoiesis? (Or)  
b) Explain about immune reactive cells.
22. a) Write about the antigen recognition. (Or)  
b) Explain in brief about cytokines.
- 23) a) Write about the vaccine toxoids.(Or)  
b) Write short note on autoimmune disorders.
- 24) a) Explain about T cell deficiencies. (Or)  
b) Give an account on AIDS vaccines.
25. a) Write about Nephelometry.(Or)  
b) Write short note on tumor antigens.

**Section-C (Answer any 3 Questions)**

26. Explain in detail about types of lymphoid organs.
27. Explain about the theories of antibody formation.
28. Write a short note on hypersensitivity types I and II
29. Write in detail about B cell and T cell deficiencies.
30. Write an essay about Macrophage culture and assay of macrophage activate (Or)

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Plant Biochemistry and Plant Biotechnology**

Paper	: Elective – II		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: 18P2BCE02	Maximum Marks : 75	: 75

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

- 1. Which one of the following is a product of both cyclic and non cyclic photophosphorylation?**  
a) NADPH b) O<sub>2</sub> c) ATP d) Carbohydrate
- 2. Which of the following is the reduced form of a temporary electron carrier molecule?**  
a) FADH<sub>2</sub> b) ATP c) NADP<sup>+</sup> d) CO<sub>2</sub>
- 3. NADP<sup>+</sup> is reduced to NADPH during**  
a) Light dependent reactions b) photorespiration c) calvin cycle d) none of these
- 4. Autophosphorylation is done on**  
a) His residues b) Ser/ Thr residues c) Lys residues d) Thr residues
- 5. Transcription factor in plants is**  
a) Serine b) Therein c) WRKY/22/29 D) Leucine
- 6. A factor involved in regulating the fate of stem cells in plant development**  
a) Adrenaline b) Epinephrine c) Thyroid stimulating hormone d) CLVI
- 7. Transpiration can be influenced by interfering with**  
a) Guard cell b) Epidermis c) Osmotic pressure d) Atmospheric temperature
- 8. Which of the following statements is not true for stomatal apparatus**  
a) Guard Cells invariably posses chloroplast and mitochondria b) Inner wall of guard cell are thick c) Stomata are involved in gaseous exchange d) Guard cells are always surrounded by subsidiary cells
- 9. Plants absorbs N<sub>2</sub> in the form of**  
a) Nitrites (NO<sub>2</sub><sup>-</sup>) b) nitrates (NO<sub>3</sub><sup>-</sup>) c) ammonium (NH<sub>4</sub><sup>+</sup>) d) all of the above
- 10. The conversion of nitrogen to ammonia nitrogenous compounds is called as**  
a) Nitrogen assimilation b) Nitrogen fixation c) Denitrification d) Nitrification
- 11. Symbiotic N<sub>2</sub> Fixing Cyanobacteria are present in all except**  
a) Anthoceros b) Azolla c) Cycas d) Gnetum
- 12. Conversion of NO<sub>2</sub> to NO<sub>3</sub> is carried out by**  
a) Nitrosomonas b) Nitrosococcus c) Nitrobacteria d) Clostridium
- 13. Genes of chromosome consists of**  
a) Genesis b) dominant genesis c) DNA d) alleles
- 14. Chromosomes are made up of special material of protein called**  
a) Cytosine b) thymine c) chromatin d) adenine
- 15. If BP is a gene pair of individual then alleles for this gene pair are**  
a) A & B b) a & b c) a & A d) b & B
- 16. Two chromosomes in pair are classified as**  
a) Heterologous chromosomes b) homologous chromosomes c) homozygous chromosomes d) heterozygous

**17. Cellular totipotency is the property of**

- a) Plants b) animals c) bacteria d) all of these

**18. Subculturing is similar to propagation by cutting because**

- a) It separates multiple microshoots and places them in a medium  
b) It uses scions to produce new microshoots  
c) They both use in vitro growing conditions  
d) All of the above

**19. What is are the benefit(s) of micro propagation or clonal propagation**

- a) Rapid multiplication of superior clones  
b) Multiplication of diseases free plants  
c) Multiplication of sexually derived sterile hybrids  
d) All of the above

**20. Protoplasts can be produced from suspension culture, callus tissues or lritact fissues by enzgratic treatment with**

- a) Cellulolytic enzmes b) pectolytic enzmes c) both cellulolytic &pectolytic enzmes  
d) Protelytic enzmes

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

21. a)Photosynthetic apparatus (Or)

- b) Write a note on photosystem

22. a)Hatch-Slack pathway (Or)

- b) Write a note on starch biosynthesis

23. a) Describe the biochemistry of nitrogen fixation (Or)

- b) Explain the interaction between nitrate assimilation and carbon metabolism

24. a) Write about organization of plant chromatin (Or)

- b) List out the advantages and uses of transgenic plants

25. a) Write a short notes on media preparation (Or)

- b) Write the uses of haploids in plant breeding

**Section-C (Answer any 3 Questions)**

26. Write in detail about photosynthetic pigment

27. Write a short notes on photorespiration

28. Explain the mechanism of symbiotic nitrogen fixation in legumes

29. Write in detail about development of chloroplast

30. Write a short notes somoclonal variation

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MODEL QUESTION PAPER M.Sc., BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Core Practical - III**

Paper : Core Practical – III  
Examination : External  
Time : Six Hours  
Paper Code : **18P3BCP03** Maximum Marks : 60

**(Answer all the questions)**

1. a) Estimate the amount of chlorophyll from plant leaf extracts. (25 Marks)  
(Or)  
b) Estimate the amount of total alkaloids
2. a) Estimate the amount of Coffeine from Tea (25 Marks)  
(Or)  
b) Determine the amount of alkaloids from lemon oil.

RECORD : 05

VIVA : 05

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MODEL QUESTION PAPER M.Sc., BIOCHEMISTRY  
YEAR I – SEMESTER II (2018-19)  
Core Practical - IV**

Paper : Core Practical – IV  
Examination : External  
Time : Six Hours  
Paper Code : **18P4BCP04** Maximum Marks : 60

**(Answer all the questions)**

1. a) Estimate the amount of DNA from Diphenylamine method (25 Marks)  
(Or)  
b) Estimate the amount of RNA by orcinol method
2. a) Determine Restriction digestion of DNA (25 Marks)  
(Or)  
b) Isolate the genomic DNA from give unknown sample

RECORD : 10

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

Paper	: Core VIII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: 18P3BC08	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.

Course No	Course Outcome	Knowledge Level
CO1	General health and common diseases, To learn how to analyse the samples (Blood, urine, pleural fluid, synovial fluid, cerebro spinal fluid and tissues and histology)	K1 & K2
CO2	Acquire knowledge on detection of body metabolites and its importance, liver function and kidney function	K1 & K2
CO3	Know about heart function, lung function test	K1, K2 & L2
CO4	diagnostic importance of various metabolic disorders and clinical aspects of various metabolic disorders.	K3 & K4
CO5	Know about Non communicable diseases and cancer markers	K3 & K4

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**CONTENT:**

**Unit I – (15 Hrs.): Basic principles and practices of clinical laboratory:** Collection of specimens – Blood, Urine, CSF, Laboratory safety –first aid in laboratory accident, 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, nephritic syndrome, dialysis, Liver function test - Clinical significance of AST, ALT, ALP and Gamma glutamyl transpeptidase, Jaundice, Pancreatic function test, Gastric function test, Cerebrospinal fluid – Blood-brain barrier, composition of CSF and chemical changes in CSF.

**Unit V – (15 Hrs.): Haematological Tests:** Disorders of mineral metabolism - Porphyria, porphyrinuria. Disorders of erythrocyte metabolism- hemoglobinopathies, thalassemia and anemia, Classification of anemia.

### 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.
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### 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.**

**WEB REFERENCE**

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

**PEDOGOGY: CHALK and Talk , PPT**

**GENETIC ENGINEERING AND FERMENTATION TECHNOLOGY**

Paper	: Core X	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>18P3BC10</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.

Course No	Coarse Outcome	Knowledge Level
CO1	The basis of gene cloning, vectors, genetic engineering techniques and large scale production of biochemical by fermentation technology.	K1 & K2
CO2	Methods to produce different genetically modified organisms	K1 & K2
CO3	Applications of genetic engineering in biotechnology	K1, K2 & K3
CO4	Become well in handling the molecular techniques like PCR, Westerblotting etc.,	K3 & K4
CO5	Understanding of how in vitro manipulation can be used to create distinct cell lineages	K4 & K5

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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 bioinsectides 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.

### TEXT BOOKS

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
4. Alberts,Johnson,(2002). **Molecular Biology of the Cell** 4<sup>th</sup> Edition Alberts,Johnson, Lewis, Raff, Roberts and Walter, Garland pub., NY
- 5 Lodish H Baltimore (2008). **Molecular Cell Biology** .6<sup>th</sup> Edition et al., .Freeman and Co., NY
6. U.Sathayanarayana (2008).**Biotechnology** Books and Allied (p)Ltd., India .

### REFERENCE BOOKS

1. Marx, J.L., (1989). **A Revolution in Biotechnology**, Cambridge Univ. press, UK
2. Smith, (1996). **Biotechnology** 3<sup>rd</sup> Edition. Smith, Cambridge Univ. press
3. Principles of **Gene Manipulation and Genomics** 7<sup>th</sup> Edition. Blackwell pub., NY.

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2. [www.nature.com/scitable/definition/plasmid-plasmids-28](http://www.nature.com/scitable/definition/plasmid-plasmids-28)
3. [www.cdc.gov/adenovirus/](http://www.cdc.gov/adenovirus/)
4. [www.thefreedictionary.com/fermentation](http://www.thefreedictionary.com/fermentation)
5. [www.atcc.org/Products/Cells\\_and\\_Microorganisms/Cell\\_Lines.aspx](http://www.atcc.org/Products/Cells_and_Microorganisms/Cell_Lines.aspx)
6. <https://www.thermofisher.com/so/en/home/.../gibco-cell.../cell-lines.html>

**PEDOGOGY: CHALK and Talk , PPT**

**YEAR II – SEMESTER III  
RESEARCH METHODOLOGY**

Paper : Core IX  
Hours/Week : 5  
Credit : 4  
Paper Code : **18P3BC10**

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Understood about basic concepts of research and its methodologies and identify appropriate research topics	K1 & K2
CO2	Provide the importance and need for research.	K1 & K2
CO3	Understood about basic concepts of research designs, ethics in scientific research.	K1, K2 & k3
CO4	Understood about basic concepts of data collection and analysis of scientific data using software along with ethical issues in human gene therapy and human cloning.	K3 & K4
CO5	Select and define appropriate research problem and parameters	K4 & K5

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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 Bologina, 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.
5. Sundar Rao, Jesudian Richard – An Introduction to Bio-Statistics
6. S.P. Gupta - **Fundamentals of Statistics**, Sultan Chand.
7. Manual of patent practice and procedure. IPR India, 2005. Ministry of commerce and industry, New Delhi, pp.163. 7.

**REFERENCE BOOKS**

1. Jerrold H. Zar, Biostatistical Analysis, Pearson Education, 4<sup>th</sup> Edition
2. Statistical Methods, Snedocor GW and Cochran WG, Oxford and IBH Publishing CO
3. Biostatistical Analysis, Zar JH, Prentice Hall Publishing House
4. Biometry, Sokal RR and Rohlf FJ, Freeman WH Publishing House
5. Biotechnology and safety assessment, John.A. Thomas, 2004. pp.333
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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www.wipo.int/wipo\_magazine/en/2006/04/article\_0003.html  
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<https://en.wikipedia.org/wiki/Database>  
[www.tutorialspoint.com/database\\_tutorials.htm](http://www.tutorialspoint.com/database_tutorials.htm)  
www.ipr-helpdesk.org/ 4.  
www.patentoffice.nic.in/ipr/patent/patents.htm

**PEDOGOGY: CHALK and Talk , PPT**

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

Paper	: Core Practical - V	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P3BCP05</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 III  
CORE PRACTICAL VI**

Paper	:Core Practical - III	Total Hours	: 45
Hours/Week	: 5	Exam Hours	: 06
Credit	: 4	Internal	: 40
Paper Code	: <b>18P3BCP06</b>	External	: 60

1. Preparation of antigen and Routes of immunization (Intra-peritoneal, Sub-cutaneous, Intra-muscular, Intra- nasal, Oral)
2. Methods of bleeding (Tail vein puncture, Intravenous, Retro orbital, cardiac vein puncture)
3. Preparation of serum and plasma from peripheral Blood
4. Identification of blood cells
5. Isolation of peripheral blood mononuclear cells.
6. Identification of blood group & Rh typing
7. Preparation of Blood antigens
8. Testing for typhoid antigens by Widal slide test
9. Pregnancy Test (Slide Test)
10. Immunodiffusion –Single radial and double diffusion
11. Immuno electrophoresis – Counter Current immunoelectrophoresis
12. Western blot analysis - Demo

**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 Mannual 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 XI	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 5	Internal	: 25
Paper Code	: 18P4BC11	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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Understood about structure and functions of the nervous system	K1 & K2
CO2	Basic understanding of the functions of various sensory organs in human system	K1 & K2
CO3	Understanding of the basic brain structure and function reaching from the molecular to systems level.	K1, K2 & k3
CO4	To understand how neural systems contribute to sensory experiences, thoughts, emotions, behavior	K3 & K4
CO5	Knowledge about mainstream concepts of neurophilosophy and ethics.	K4 & K5

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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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<https://en.wikipedia.org/wiki/Blood>  
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**PEDOGOGY: CHALK and Talk , PPT**

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

Paper	: Core XII	Total Hours	: 75
Hours/Week	: 5	Exam Hours	: 03
Credit	: 4	Internal	: 25
Paper Code	: <b>18P4BC12</b>	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.

**COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	Students learn about Biological databases	K1 & K2
CO2	Tools for database search system.	K1 & K2
CO3	Protein structure analyses and prediction and drug design and nanoparticles	K1,K2 & k3
CO4	An ability to design and conduct experiments, as well as to analyze and interpret data	K3 & K4
CO5	Characterization methods for nanomaterials, understanding and critiquing nanomaterial safety and handling methods required during	K4 & K5

**Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S
CO5	S	S	S	S

S- Strong; M-Medium; L-Low

**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, Paragastogi (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**
8. **Metabolomics** – Royston Goodacre.

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[www.metabolomicdiscoveries.com/](http://www.metabolomicdiscoveries.com/)

<https://www.bruker.com/industries/life-sciences/metabolomics.html>

**PEDOGOGY: CHALK and Talk , PPT**

### YEAR II – SEMESTER IV HUMAN PHYSIOLOGY

Paper : Core XIII  
Hours/Week : 5  
Credit : 4  
Paper Code : 18P4BC12

Total Hours : 75  
Exam Hours : 03  
Internal : 25  
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.

#### **COURSE OUTCOME:**

Course No	Coarse Outcome	Knowledge Level
CO1	The anatomy, biological, physiological activities along with the mechanism of action of various organs and various alimentary parts of human body.	K1 & K2
CO2	Gives an idea about heart and its regulation	K1 & K2
CO3	Provides Knowledge about digestive secretion and urine formation	K1, K2 & K3
CO4	Obtain an insight about respiration and Neurons	K3 & K4
CO5	Provides knowledge about Hormone and its regulation.	K4 & K5

#### **Mapping with Programme Outcomes**

COs	PO1	PO2	PO3	PO4
CO1	S	S	M	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S

CO5	S	S	S	S
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S- Strong; M-Medium; L-Low

### 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 Elseviars India Pvt. Ltd. (New Delhi). ISBN: 978-1-4160-4574-8.
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.

### REFERENCE

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 th 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-
5. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W., (2012) **Harper's Biochemistry** 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.4

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**PEDOGOGY: CHALK and Talk , PPT**

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN**  
**(AUTONOMOUS)**  
**MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY**  
**YEAR II – SEMESTER III (2018-19)**  
**Advanced Clinical Biochemistry**

Paper	: Core Paper VIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P3BC08</b>	Maximum Marks	: 75

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

**1. The probability that a test result falls within the reference interval in the absence of disease is called the test's**

A) efficiency B) negative predictive value C) specificity D) sensitivity

**2. Causes of a prolonged thrombin time include all of the following except**

A) D.I.C. B) afibrinogenemia C) decreased factor X C) heparin D) hypofibrinogenemia

**3. Which of the following is not a cause of hyperuricemia?**

A) Lesch-Nyhan syndrome B) renal retention C) organic acidemia D) defects in pyrimidine metabolism

**4. Which of the following should not be included in the differential diagnosis of hypercalcemia?**

A) vitamin D intoxication B) vitamin D-dependent rickets C) excess absorption secondary to the "milk alkali syndrome" D) primary hyperparathyroidism

**5. D.I.C. associated with infection is most frequently caused by**

A) Cytomegalovirus B) HIV C) gram-negative organisms D) hepatitis B

**6. Which of the following proteins is most useful in detecting rejection of transplanted kidneys?**

A)  $\beta_2$  -microglobulin B)  $\alpha_2$  -macroglobulin C) lysozyme D) C-reactive protein

**7. Type 1 diabetes is what percentage of all diabetes mellitus?**

A) >20% B) 5-10% C) 16-20% D) 11-15%

**8. An important renal response to acidemia is**

A) Increased potassium excretion B) decreased excretion of  $H_2PO_4^-$  C) increased production of ammonia D) increased production of  $HPO_4^{2-}$

**9. Hyperamylasemia is commonly caused by administration of**

- A) antibiotics B) diuretics C) opiates D) anticonvulsants

**10. Elevation in total CSF protein may be seen in all the following states except**

- A) epilepsy B) brain tumor C) CNS trauma D) stroke

**11.  $\beta_2$ -Microglobulin levels are least useful in patients with**

- A) cadmium poisoning B) skeletal muscle disease C) rejected kidney transplant D) acute leukemia

**12. In diabetes mellitus, glucagon levels are**

- A) elevated due to high insulin B) lowered due to high conversion to glucose C) lowered due to low insulin D) elevated and not suppressed by carbohydrate loading

**13. Which of the following proteins is the best indicator of hemolysis?**

- A) ceruloplasmin B) hemosiderin C) transferrin D) haptoglobin

**14. Which of the following can cause urine to have a purple color?**

- A) homogentisic acid B) bilirubin C) hemoglobin D) myoglobin

**15. Microalbuminuria is**

- A) excretion of albumin metabolites A) albumin concentrations that are slightly above normal urine C) albumin concentrations below the reference intervals D) high serum albumin, low urine albumin

**16. Patients with porphyria cutanea tarda have a deficiency of**

- A) protoporphyrinogen oxidase B) uroporphyrinogen decarboxylase C) coproporphyrinogen oxidase D) ferrochelatase

**17. An Lp(a) concentration exceeding 300 mg/l indicates**

- A) high genetic risk for coronary heart disease B) high acquired risk for coronary heart disease C) high risk when present in the elderly D) normal value

**18. The presence of which cast has the least clinical significance?**

- A) red cell B) epithelial C) waxy D) granular

**19. Which of these is characterized by increased blood viscosity, Bence Jones proteins, and enlarged lymph nodes and spleen?**

- A) hepatoma B) multiple myeloma C) Wilson's disease D) Waldenstrom's macroglobulinemia

**20. A positive urine for bilirubin can be caused by the presence of**

- A) unconjugated bilirubin B) any of these compounds C) conjugated bilirubin D) delta bilirubin

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

21. a) Write about Amniotic fluids (Or)

- b) Discuss about automation in clinical laboratory.

22. a) Explain about Insulin receptor (Or)

- b) Write about disorders of cholesterol metabolism.

23. a) Write an note on alkaptonuria (Or)

- b) Explain Gout.

24. a) Write about Dialysis (Or)

- b) Discuss about Cerebrospinal fluid.

25. a) Write about hemoglobinopathies (Or)

- b) Classify Anemia.

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

26. Discuss briefly about collection of specimens?
27. Explain about diabetes mellitus ?
28. Explain about inborn error of branched chain amino acids ?
29. Discuss about renal function test?
30. Write about disorder of erythrocyte metabolism?

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2018-19)  
Genetic Engineering and Fermentation Technology**

Paper	: Core Paper X		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P3BC10</b>	Maximum Marks	: 75

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

1. Type II restriction endonuclease enzyme cuts the sequence in the following way
  - a) Within the recognition sequence
  - b) At 100-1000 nucleotides away from the recognition sequence
  - c) At 27-30 nucleotides away from the recognition sequence
  - d) It cuts randomly
2. Which endonuclease cleaves both single and double stranded DNA molecules, in a non-specific manner?
  - a) S1
  - b) Bal31
  - c) DNase I
  - d) BamHI
3. Linkers are often used in cloning. Choose the incorrect statement for linkers.
  - a) These are short chemically synthesized molecules that contain a particular restriction enzyme site within the sequence
  - b) They are blunt ended molecules
  - c) They are ligated to staggered ended insert molecules by T4 DNA ligase
  - d) After treatment with enzyme, both the ends of the linker are staggered
4. If linkers are combined with other features such as a selectable marker, it is called as
  - a) cassette
  - b) modified linker
  - c) adaptors
  - d) induced linker
5. Which antibiotic resistance is present in pBR322?
  - a) Ampicillin
  - b) Kanamycin
  - c) Lactase
  - d) Gentamycin
6. What is the copy number of the pUC8 plasmid vector?
  - a) 5-10
  - b) 50-100
  - c) 100-200
  - d) 500-700
7. In genome southern blotting can be used to identify
  - a) Sequences
  - b) number of sequences
  - c) DNA fragments
  - d) RNA sequence
8. Western blotting is the technique for the detection of
  - a) specific DNA in a sample
  - b) specific RNA in a sample
  - c) specific protein in a sample
  - d) specific glycolipid in a sample
9. The ability of cells to take up DNA fragments from surrounding is called
  - a) transfection
  - b) transduction
  - c) transformation
  - d) conjugation
10. Chemicals used for gene transfer methods include

- a) poly ethylene glycol b) CaCl<sub>2</sub> c) dextran d) all of the above
11. Introduction of DNA into cells by exposing to high voltage electric pulse is
    - a) electrofusion b) electrofision c) electrolysis d) electroporation
  12. The injection of DNA into developing inflorescence using a hypodermic syringe is called
    - a) macroinjection b) micromanipulator mediated DNA delivery c) microfection d) microinjection
  13. Polymerase used for PCR is extracted from
    - a) Escherichia coli b) Homo sapiens c) Thermus aquaticus d) Saccharomyces cerevisiae
  14. At what temperature do denaturation of DNA double helix takes place?
    - a) 60° b) 54° c) 74° d) 94°
  15. Luciferase genes are also used at times for detection. Choose the correct statement for them.
    - a) They are obtained from fire flies only b) The detection requires provision of substrate which produces light c) Enzymes such as beta-galactosidase requires substrate X-gluc to produce light d) Lucifearse genes are preferred over fluorescent proteins
  16. A short peptide region fused to a protein of interest is known as
    - a) tag b) oligonucleotide c) fragment d) dimer
  17. Name the technique which is used to enhance the life of a tomato.
    - a) Antisense technology b) In vitro gene transfer c) Ex vivo gene transfer d) Molecular farming
  18. The process of expression of foreign genes in a plant is called
    - a) Gene expression b) Transgenesis c) Genetic transformation d) Cell hybridization
  19. Which of the following virus is not used in gene therapy?
    - a) Papillomavirus b) Retrovirus c) Adenovirus d) Herpes simplex virus
  20. What is responsible for slicing the left border and right border of Ti plasmid
    - a) Vir proteins b) Agrobacterium c) Gram positive bacteria d) None of the above

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

- 21.a) Define gene & its function (Or)  
b) Explain Gene cloning Techniques.
- 22.a) Write about vector and its types (Or)  
b) Explain Restriction enzymes.
- 23.a) Write about Plasmid DNA (Or)  
b) Write short note on Papilloma viruses.
- 24.a) Explain fermentation process (Or)  
b) How to screen fermentation process.
- 25.a) Advantages & disadvantages of cell culture (Or)  
b) How to prepare the culture medium.

**Section-B (Answer any 3 Questions)**

26. How to developed the gene & its importance
27. Write about plasmid DNA & its types
28. How to perform the restriction enzyme in cloning process.
29. Describe about Downstream processing technique.
30. Explain about Isolation & purification of stem cells.

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN  
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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2018-19)  
Research Methodology**

Paper	: Elective III		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P3BC09</b>	Maximum Marks	: 75

**1. A research is generally expected to**

- a) Study the existing literature in a field    b) Generate new principles and theories  
c) Synthesize the ideas given by others    d) Evaluate the findings of a study

**2. The basic need of a research is**

- a) in preparation of a project    b) in guidance    c) in economic planning    d) in sitting in library

**3. A research should be**

- a) objective    b) valid    c) reliable    d) all the above

**4. Hypothesis is**

- a) a thoughtful statement    b) a forwarding statement    c) a temporary solution    d) all the above

**5. Variance of the population is denoted by**

- a)  $\mu^2$     b)  $\sum^2$     c)  $\beta^2$     d)  $\sigma^2$

**6. The standard deviation tends to increase with the increase in**

- a) regression    b) mean    c) correlation    d) variability

**7. When the correlation between two variables is estimated by taking into account the effect of a third variable it is called**

- a) partial correlation    b) regression    c) perfect relation    d) multiple correlation

**8. Regression is of how many types?**

- a) 2    b) 4    c) 1    d) 5

**9. The probability of an event is**

- a) The average frequency of the event    b) frequency    c) sum of the events    d) independent event

**10. When a random experiment is performed repeatedly, each repetition is called a**

- a) trial    b) event    c) success    d) repeats

**11. A random variable X is said to follow a Poisson distribution if it assumes only**

- a) non-negative values    b) negative values    c) positive values    d) non positive values

**12. Normal distribution was first discovered by**

- a) James Bernoulli    b) De-Moivre    c) Morgan    d) Rutherford

**13. What is the name of the statement making a prediction that an event will occur under**

stated.

- a) null hypothesis      b) hypothesis      c) significance      d) Probability

**14. Systematic sampling is**

- a) a comprehensive method of sample selection      b) a simple method of sample selection  
c) an effective method of generalization of data      d) all the above

**15. The t-distribution is used when sample size is**

- a) 30    b) 50    c) 60    d) 80

**16. In order to test the “goodness of fit” of the observed results, it is necessary to find**

- a) the deviation between the observed and the expected results      b) the probability value corresponding to the deviation  
c) both a and b      d) none of the above

**17. WIPO stands for**

- a) World Industries Property organization      b) world Intellectual Property Organization  
c) World Intellectual Property Organisation      d) World Industries Property Organization

**18. The unethical practice of monopolizing a biodiversity based traditional knowledge is called**

- a) stolen    b) biopiracy    c) unregistered    d) loot.

**19. The term which describes the safe methods for managing infectious agents in the laboratory environment is**

- a) practice    b) containment    c) environment    d) safety

**20. Which committee should take note of developments at national and international levels in Biotechnology towards the currentness of the safety regulation for India on recombinant research use and applications?**

- a) Recombinant DNA Advisory Committee      b) Institutional Biosafety Committee  
c) Review Committee on Genetic Manipulation      d) Genetic Engineering Approval Committee

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

21. a) Describe about Ethics and scientific research (Or)

b) Explain about the review of literature

22. a) Write about Student t test correlation (Or)

b) Write about the standard deviation

23. a) Write about the scope of bioinformatics (Or)

b) Write short note on role of computers in biology

24. a) Explain about database system (Or)

b) Give an account on CLUSTAL

25. a) Write about Ethics in food and drug safety (Or)

b) Write a short note on gene therapy.

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

26. Explain in detail about Formulation of hypothesis.

27. Explain about the Chi square test for independence of attributes

28. Write a short notes on PubMed.

29. Write in detail about FASTA and BLAST

30. Write an essay about Ethics in animal experimentation.

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER III (2018-19)  
Core Practical - V**

Paper	Core Practical V		
Examination	: External		
Time	: Six Hours		
Paper Code	: <b>18P3BCP05</b>	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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YEAR II – SEMESTER III (2018-19)  
Core Practical - VI**

Paper : Core Practical VI  
Examination : External  
Time : Six Hours  
Paper Code : **18P3BCP06** Maximum Marks : 60

**Answer all the questions**

1.A) Immuno electrophoresis – Rocket or Counter Current immunoelectrophoresis

(Or)

B) Isolation of peripheral blood mononuclear cells.

2 (a). Identification of blood group & Rh typing

(Or)

(b) Immunodiffusion –Single radial and double diffusion

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER IV (2018-19)  
Neuroscience**

Paper	: Core Paper XI		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P4BC11</b>	Maximum Marks	: 75

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

- 1. The central nervous system is composed of more than**  
a) 200 billion neurons   b) 100 billion neurons   c) 140 billion neurons   d) 250 billion neurons
- 2. Among the following, which is not a neurotransmitter ?**  
a) acetylcholine   b) histamine   c) glutamate   d) proline
- 3. The synaptic membrane of the presynaptic terminals contains large numbers of**  
a) voltage – gated calcium channels   b) ion channels   c) receptors   d) active protein kinase
- 4. Which of the following transmitters is required to cause sleep of the person?**  
a) serotonin   b) glutamate   c) dopamine   d) acetylcholine
- 5. The higher intellectual functions are associated with the**  
a) parietal area   b) prefrontal area   c) temporal   d) occipital
- 6. Memories which last for seconds or minutes comes under**  
a) short term memories   b) long term memories   c) immediate memories   d) delayed memories
- 7. The major part of the limbic system is**  
a) hypothalamus   b) spinal cord   c) medulla oblongata   d) pituitary
- 8) Expand REM.**  
a) Remote Eye Movement   b) Rapid Eye Movement   c) Reverse Eye movement   d) None of the above
- 9) How many classification of pains are there?**  
a) 4   b) 1   c) 3   d) 2
- 10. The chemicals in the rods are called?**  
a) rhodopsin   b) scotopsin   c) retinene   d) retinol
- 11. The photochemicals in cones have the protein portions called as**  
a) photopsin   b) scotopsin   c) rhodopsin   d) retinene
- 12. The receptor cells for the smell sensation are the**  
a) olfactory cells   b) smell cells   c) taste cells   d) aroma cells
- 13. The loss of thinking is called as**  
a) dementia   b) Parkinsonism disease   c) schizophrenia   d) tetanus

**14) Alzheimer's disease**

- a) was cured in 2004    b) has no cure    c) can be reversed with drugs    d) can be reversed with therapy

**15. Parkinson's disease is a**

- a) a movement disorder    b) a neurodegenerative disorder    c) only b    d) both a and b

**16. Which vitamin turns l-dopa into dopamine**

- A) vitamin C    b) vitamin D    c) Vitamin B6    d) vitamin K

**17. Which type of drugs produces sleep resembling natural sleep?**

- a) hypnotic    b) sedative    c) anticonvulsants    d) muscle relaxants

**18. Which enzyme is the inhibitor of monoamine oxidase**

- a) selegiline    b) amantadine    c) ropinirole    d) belladonna

**19. The drugs effective in relieving symptoms of psychosis in the short term comes under**

- a) antipsychotics    b) antidepressants    c) tranquilizers    d) all the above

**20) what drugs are used to relieve pain without causing loss of consciousness?**

- a) antidiabetic    b) analgesics    c) antagonists    d) antipyretic

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

21. a) Describe about neuroglia (Or)  
b) Explain about synapse
22. a) Write about neurohormones (Or)  
b) Write about memory
- 23) a) Write about the somatic sensation (Or)  
b) Write short note on colour blindness
- 24) a) Explain about dementia (Or)  
b) Give an account on muscular dystrophy
25. a) Write about CNS stimulants (Or)  
b) Write a short note on analgesics

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

26. Explain in detail about autonomic nervous system
27. Explain about the structure and function of brain
28. Write a short notes on photoreceptors
29. Write in detail about Huntington's disease
30. Write an essay about CNS depressants.

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER IV (2018-19)  
Bioinformatics and Nanotechnology**

Paper	: Core Paper XIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P4BC12</b>	Maximum Marks	: 75

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

**1. Which of these is not a protein sequence database?**

- a) PIR b) Genbank c) PDB d) COGs

**2. Global alignment uses \_\_\_\_\_ algorithm**

- a) Smith-Waterman algorithm b) Needleman-Wunsc algorithm c) Dot Plots d) DALI

**3. FASTA program was first described by**

- a) Lipmann and Pearson b) Adachi and Hasegawa c) Fitch and Margoliash d) Kyte and Dolittle

**4. BAC stands for**

- a) Bacteria Artifice Chromosome b) Bacterial Artifice Chromatid c) Bacterial Artificial Chromatid d) Bacterial Artificial Chromosome

**5. TAP Tags are useful for**

- a) protein resolution b) genome sequencing c) peptide sequencing d) proteome exploration

**6. Bioinformatics can not analyse**

- a) Mathematical analysis b) Statistical analysis c) Biomedical analysis d) Chemical analysis

**7. URL for NCBI is**

- a) www.ncbi.nlm.nih.gov b) www.ncbi.gov c) www.ncbi.nih.nlm.gov d) www.ncbi.nlm.gov

**8. GCG is**

- a) Protein sequencing tool b) Compare two DNA or protein sequences  
c) Compare multiple DNA or protein sequences d) Nucleic acid sequencing tool

**9. Clustal W**

- a) multiple sequence alignment tool b) Protein secondary structure predicting tool c) Data retrieving tool d) Nucleic acid sequence analysis tool

**10. Which is data retrieving tool?**

- a) KEGG b) EMBL c) ENTREZ d) PHD

**11. Motifs of protein sequences are**

- a) Secondary databases b) Relational databases c) Primary databases d) Object oriented

databases

**12. BLASTX program is used for**

- a) Translate DNA database    b) Translate input sequence    c) Translate both sequence  
d) Translate protein sequence

**13. “There is a plenty of room at the bottom”. This was stated by**

- a) Issac Newton    b) Albert Einstein    c) Richard Feynman    d) Eric Drexler

**14. 1 nanometre = \_\_\_\_\_ cm**

- a)  $10^{-9}$     b)  $10^{-8}$     c)  $10^{-7}$     d)  $10^{-6}$

**15. The size of E.colibacter a is \_\_\_\_\_ nm**

- a) 75000    b) 2000    c) 200    d) 5

**16. The most important property of nanomaterials is**

- a) force    b) friction    c) pressure    d) temperature

**17. Which one of these statements is not true?**

- a) Gold at the nanoscale is red    b) copper at the nanoscale is transparent    c) Silicon at the nanoscale is an insulator    d) Aluminum at the nanoscale is highly combustible

**18. What is graphene?**

- a) A new material made from carbon nanotubes    b) a one-atom thick sheet of carbon    c) Thin film made from fullerenes    d) a software tool to measure and graphically represent nanoparticles.

**19. Which of the following is the application of nanotechnology to food science and technology?**

- a) Agriculture    b) Food safety and biosecurity    c) Product development    d) all the above

**20. The nanoparticles from iron and palladium are used to produce**

- a) magnets    b) magnetic lens    c) magnetometers    d) magnetic storage devices.

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

21. a) Write about the Bioinformatics (Or)

b) Explain about FASTA format

22. a) Write about the Bioinformatics (Or)

b) Explain about FASTA format

23. a) How to search the sequences (Or)

b) How to do the substitute Matrix

24. a) Define Nanotechnology & Length scales (Or)

b) Write short on applications of Nanotechnology

25. a) Short note on fluorescence (Or)

b) Write about Carbon Nano tubes

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

26. Explain the Multiple Sequence alignment

27. Briefly explain the Bioinformatics tool

28. Describe the drug discovery & development

29. Explain the history of Nanotechnology

30. Explain Gold Nanoparticles

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MODEL QUESTION PAPER M.Sc. BIOCHEMISTRY  
YEAR II – SEMESTER IV (2018-19)  
HUMAN PHYSIOLOGY**

Paper	: Core Paper XIII		
Examination	: External	Section – A (5X5)	: 25
Time	: Three Hours	Section – B (5X10)	: 50
Paper Code	: <b>18P4BC12</b>	Maximum Marks	: 75

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

- 1. The basic unit of contraction is the**  
a. myosin b. actin c. Z-Lines d. sarcomeres
- 2. A cord or strap of dense tissue that connects a muscle to bone is called a:**  
a. tendon b. ligament c. bursa d. arthritis
- 3. The functional partners of bone is:**  
a. Tendon b. Ligament c. Skeletal muscle d. Fasciae
- 4. What are dark bands that define the two ends of each sarcomeres called.**  
a. myosin b. actin c. Z-Lines d. sarcomeres
- 5. This is the explanation of how muscles contract.**  
a. Lock and Key Hypothesis b. Cell Theory c. Mendels laws d. Sliding filament model
- 6. Mechanical breakdown of food is due to**  
a. hydrochloric acid b. pepsin c. chewing d. peristalsis
- 7. Removal of waste products from a body is known as**  
a. egestion b. ingestion c. digestion d. absorption
- 8. Process of absorption of food molecules from digestive track by blood vessels is called**  
a. absorption b. assimilation c. digestion d. ingestion
- 9. The stomach:**  
a. does chemical digestion only. b. does mechanical digestion only. c. does both chemical and mechanical digestion. d. starts the chemical digestion of starchy foods
- 10. By the time food leaves the stomach it is:**  
a. a creamy paste called chyme. b. rolled into a bolus. c. ready to be mixed with pepsin for protein digestion. d. None of the above
- 11. The accessory digestive organs include all of the following, EXCEPT:**  
a. tongue b. liver c. pancreas d. stomach
- 12. \_\_\_\_\_ plays a role in holding one's breath**

a. true vocal cords b. false vocal cords c. Pharynx d. epiglottis

**13. \_\_\_ Internal respiration is at the level of the**

a. organism b. cell c. lungs d. pharynx

**14. \_\_\_ Which of the following occurs as air rushes into the lungs to equalize air pressure?**

a. inhalation b. contraction c. exhalation d. None of the above.

**15. \_\_\_ The actual exchange of gases occurs at the site of the**

a. larynx b. nasal passage c. trachea d. alveoli

**16. \_\_\_ Each alveolus**

a. contains many air sacs b. is surrounded by capillaries c. attaches to the larynx d. is a large air sac

**17. \_\_\_ Gas exchange occurs when**

a. oxygen in the alveoli diffuses into the blood in the capillaries

b. oxygen binds with hemoglobin in the red blood cells c. the red blood cells give up oxygen to the cells of the body tissues

d. All of the above.

**18. \_\_\_ When the diaphragm and rib cage muscles relax**

a. the chest cavity enlarges b. expiration occurs c. inspiration occurs d. it is impossible to breath

**19. Which of the following is the contractile protein of a muscle?**

a) Tubulin b) Myosin c) Tubulin d) all of these

**20. The contractile protein of skeletal muscle involving ATPase activity is**

a) actin b) myosin c) troponin d) tropomyosin

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

21.a) Write about the eyes (Or)

b) Explain about structure of skeletal muscle

22. a) Write about the Blood coagulation (Or)

b) Explain about digestion of carbohydrates

23. a)How to transport the gases (Or)

b)How the urine formation occur

24. a)Write about structure of neuron (Or)

b) Write short on neurotransmitter

25. a) Short note on Spermatogenesis (Or)

b) Write about ovarian cycle

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

26. Explain about muscles

27. Briefly explain gastero intestinal hormones

28. Describe the excretory system of human body

29. Explain the classification of nervous system

30. Explain female reproductive system

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

**PART – A (20X 1=20 marks)**

Multiple Choice Questions

**PART – B (5 X 05 = 25 marks)**

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

**PART – C (3 X 10 = 30 marks)**

Answer any 3 Question