

## **B.Sc., BIOCHEMISTRY**

### **I. SCOPE OF THE COURSE**

The Undergraduate Degree Course in Biochemistry, offered by Vivekananda College of Arts and Sciences for Women, aims in cherishing the young enterprising students with flexible plan to accomplish scientific goals. The Biochemistry, a unique course emphasizes the universal features concerned with the chemistry of life in any form. Every biological phenomenon in terms of changes in explained at the molecular level. The study of biochemistry helps to navigate the ocean of information of several doctrines like Nursing, Diagnostics, Pharmacies, Physiotherapy, Industries, Bioinformatics, and Microbiology etc. It's lucidly increasing scope will predominate all the fields with radiant developments.

### **II. SALIENT FEATURES**

- Frequent Guest lecturers from Industrialists, Central Research Organizations and Universities will be arranged.
- Course is specially designed to pursue higher level of Education and for Career Placement.
- Special Hands on Training in Clinical experiments and Molecular techniques are parts of the Degree Course.
- Visits to Pharmaceutical Industries and Central Research institutes.

### **III. OBJECTIVES OF THE COURSE**

- Develop skills effectively in interpreting all laboratory reports.
- Develop competence to perform relevant investigations which will help to diagnose important medical conditions.
- Demonstrate competence in basic concepts of research methodology and Biochemistry.
- Function as a productive member of a team engaged in health care, research and education
- Demonstrate communication skills of a high order in explaining management and prognosis, providing counseling and giving health education message to patients and communities.
- Demonstrate empathy and have a human approach towards patients and respect their sensibilities.

#### **IV. ELIGIBILITY FOR ADMISSION**

##### **Candidates seeking admission to the first year B.Sc., Degree course**

A candidate who has passed Higher Secondary board of Examination in biological science or physical science under higher secondary board of Examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an Examination accepted as Equivalent there to by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc., Biochemistry Degree examination of this University after a course of study of three academic years.

#### **V. DURATION OF THE COURSE**

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

#### **VI. CONTINUOUS INTERNAL ASSESSMENT**

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

##### **Attendance Marks (5 Marks)**

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

**Theory Internal Marks (25 marks)**

S.No	Segregation	Marks
1	Average of two Tests	15
2	Assignment	5
3	Attendance	5
	<b>Total</b>	<b>25</b>

**Practical Internal Marks (40 marks)**

S.No	Segregation	Marks
1	Attendance	10
2	Observation note	10
3	Model Exam	20
	<b>Total</b>	<b>40</b>

**VII. PASSING MINIMUM.**

**EXTERNAL**

In the University Examinations, the passing minimum shall be 40 % out of 75 Marks (30 Marks).

**VIII. ELIGIBILITY FOR EXAMINATION**

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

**IX. CLASSIFICATION OF SUCCESSFUL CANDIDATES**

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

- a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
- b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
- c) 50% and above but below 60% shall be declared to have passed the examinations in second class.

- d) All the remaining successful candidates shall be declared to have passed the examinations in third class.
- e) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of three consecutive academic years from the year of admission only will be eligible for University rank.

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

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

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

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

## **XII. COMMENCEMENT OF THESE REGULATIONS**

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

**SCHEME OF EXAMINATIONS – UG BIOCHEMISTRY**

(for the candidates admitted during the academic year 2017-2018 onwards)

B.Sc., Biochemistry Syllabus, Candidates Admitted From 2017-2018 Onwards

Sem	Subject code	Part	Course	Subjects	Hrs/ week	Credit	Int. marks	Ext. mark	Tot. mark
I	17U1LT01	I	Language-I	Tamil-I	4	3	25	75	100
	17U1LH01			Hindi-I					
	17U1LM01			Malayalam-I					
	17U1LE01	II	English-I		4	3	25	75	100
	17U1CHA01	III	Allied-I	Allied- chemistry	4	4	25	75	100
				Practical	4	3	40	60	100
	17U1BCC01	III	Core-I	Chemistry of Biomolecule	5	5	25	75	100
	17U1BCCP01			Core-I	Major Practical-I	5	3	40	60
17U1VE01			Value education – (Yoga)	2	2	25	75	100	
			Lib and Sports	2	0				
			<b>Total</b>	<b>30</b>	<b>23</b>	<b>165</b>	<b>435</b>	<b>600</b>	
II	17U2LT02	I	Language-II	Tamil-II	4	3	25	75	100
	17U2LH02			Hindi-II					
	17U2LM02			Malayalam-II					
	17U2LE02	II	English-II		4	3	25	75	100
	17U2CHA02	III	Allied-II	Allied Chemistry II	4	4	25	75	100
	17U2BCC02	III	Core-II	Enzymes and Enzyme Technology	5	5	25	75	100
	17U2CHAP01	III	Allied	Allied Practical-I	4	3	40	60	100
	17U2BCCP02	III	Core	Major Practical-II	5	3	40	60	100
	17U2VES01	IV		Environmental studies	2	2	25	75	100
			Lib and Sports	2	0				
			<b>Total</b>	<b>30</b>	<b>23</b>	<b>205</b>	<b>495</b>	<b>700</b>	
III	17U3LT03	I	Language-III	Tamil-III	4	3	25	75	100
	17U3LH03			Hindi-III					
	17U3LM03			Malayalam-III					
	17U3LE03	II	English-III		4	3	25	75	100
	17U3UMB03	III	Allied-III	Allied Microbiology	4	4	25	75	100
				Allied Lab	Microbiology Lab	4	3	40	60
	17U3BCC03	III	Core-III	Major-Biochemical Techniques	5	5	25	75	100
	17U3BCCP03			Major Practical-III	5	3	40	60	100
				Lib and Sports	2	0			
17U3BCS01	IV	SBEC-I	Biostatistics	2	2	25	75	100	
			<b>Total</b>	<b>30</b>	<b>23</b>	<b>205</b>	<b>495</b>	<b>700</b>	
IV	17U4LT04	I	Language-IV	Tamil-IV	4	3	25	75	100
	17U4LH04			Hindi-IV					
	17U4LM04			Malayalam-IV					
	17U4LE04	II	English-IV		4	3	25	75	100
	17U4CSA04	III	Allied-IV	Biotechnology	4	4	25	75	100
	17U4CSAP03		Allied-Lab	Allied Biotechnology lab	4	3	40	60	100
	17U4BCC04			Major					
			Intermediate Metabolism	5	5	25	75	100	
				5	5	25	75	100	

B.Sc., Biochemistry Syllabus -2017, VICAS – Autonomous

**Aim:**

To understand the structure, functions and behavioral properties of biomolecules.

**Objective:**

The objective of the paper is to make the students to understand the structure, properties and functions of the biomolecules like carbohydrates, lipids, proteins, nucleic acids, vitamins and minerals.

**Unit I:**

**(15 Hours)**

**Carbohydrates**—Occurance, Definition and Classification of carbohydrates.

Monosaccharides –Structure of aldose and ketoses, stereo isomerism and optical isomerism of sugars, anomers, epimers, enantiomers and mutarotation of sugars. Monosaccharides: linear and cyclic structure of glucose, fructose, galactose, mannose and ribose. Functions. Reactions of sugars due to keto and aldo group, action of acids and alkalies on sugars, reactions of sugars due to hydroxyl group.

Disaccharides – Occurance, Structure, chemistry and functions of sucrose, lactose, maltose and cellobiose.

Homopolysaccharides- structure of starch, glycogen and cellulose. Heteropolysaccharides- structure and function of hyaluronic acid and heparin

Sugar derivatives: Sugar alcohols, sugar acids, aminosugars and deoxysugars.

**Unit II:**

**(15 Hours)**

**Lipids** - Definition, classification of lipids, simple, compound with examples and derived functions.

Simple lipids- classification, nomenclatures, structures of fatty acids Physical and chemical properties of fatty acids – Saponification number, acid number, Iodine number and RM number and their applications.

Compound lipids-Structure and function of phospholipids, glycolipids and lipoproteins.Storage and membrane lipids.

Steroids-Structure and functions of cholesterol, ergosterol and stigmasterol.

**Unit III:**

**(15 Hours)**

**Amino acids and Proteins** – Amino acids-Definition, classification based on charge and polarity, structure and properties: stereo and optical isomerism zwitter ions in aqueous solution, General reactions of aminoacids based on carboxyl group, aminogroup and both carboxyl and aminogroup.Essential and nonessential and semiessential aminoacids.

Peptides: Definition, formation and examples (glutathione, oxytocin and vasopressin)

Protein: classifications based on shape, solubility and composition and function.

Protein Architecture: Primary, secondary( excluding Ramachandran plot), tertiary and quaternary structure of Proteins.

**Unit IV:**

**(15 Hours)**

**Nucleic acids** – Introduction, Composition - Structure of Purines and Pyrimidines- Nucleotides and Nucleosides.

DNA - Double helix – Watson and Crick model, A, B and Z forms of DNA. Properties of nucleic acid: tm, denaturation, renaturation hypo and hyperchromicity.

RNA – Types (mRNA, tRNA, rRNA and hnRNA) . Unusual bases in nucleic acids.

**Unit V:**

**(15 Hours)**

Vitamins and Minerals - Definition, Classification of Fat soluble vitamins (A, D, E, K) and Water soluble vitamins (B complex vitamins & Vitamin C) - Sources, Chemical nature (without structure), functions and deficiency symptoms.

Minerals: Requirements, macro and micro minerals (source and functions).

**TEXT BOOKS:**

1. Jain, J.L. (2007) **Fundamentals of Biochemistry**. 3<sup>rd</sup> Revised Edition. S.Chand and Co Ltd, New Delhi.
2. Satyanarayana, U. (2002). **Biochemistry**. 2<sup>nd</sup> Edition. Books and Allied (P) Ltd.
3. Voet, D. and Voet, G. (2008), **Fundamentals of Biochemistry** – Life at the Molecular level, 2<sup>nd</sup> Edition, John Wiley & Sons. Inc., New York.
4. Zubay, G. (1999), **Biochemistry**. 4<sup>th</sup> Edition, WCB. McGraw-Hill, New York.

**REFERENCE BOOKS:**

1. Nelson, D.L. and Cox, M. M. (2008). **Lehninger's Principles of Biochemistry**. 6<sup>th</sup> Edition. Freeman Publishers. New York.
2. Stryer, L. and Hall, J.E. (2009). **Biochemistry**: Library of Congress Cataloguing-in-Publication Data, Bery, Jeremy Mark.
3. Robert Murray, Bender, (2012) **Harper's Illustrated Biochemistry**. 29<sup>th</sup> Edition, McGraw Hill.
4. Harper's Biochemistry () Robert K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25<sup>th</sup> edition.

**Semester: II**  
**Paper Code: 17U2BCC02**  
**Credit : 05**

**Core Paper : II**  
**Total Number of Hours : 75**  
**5Hours/ Week**

## ENZYMES AND ENZYME TECHNOLOGY

### **Aim:**

To inculcate knowledge on enzymes, classification structure kinetics and applications.

### **Objectives:**

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

### **Unit I: (15 Hours)**

**Enzymes**– Introduction, Nomenclature and Classification of enzymes. Holoenzyme, apoenzymes, prosthetic group, metalloenzymes and metal activated enzymes, monomeric enzymes, oligomeric enzymes, abzymes, ribozymes, enzyme specificity and enzyme units. Definition – co-enzymes, co-factors.

### **Unit II: (15 Hours)**

**Active site**–Definition, theories of ES complex–Lock and key, induced fit theory.

**Enzyme kinetics** –Order of reaction, Activation Energy, Derivation of Michaelis - Mentone equation. Linear modification of Line – Weaver and Burk plot, Eadie – Hofstee plot. Significance of  $K_m$  and  $V_{max}$ . Factors affecting the enzyme activity - pH, temp, enzyme and substrate concentration, inhibitors and activators.

### **Unit III : (15 Hours)**

Enzyme inhibition – Reversible inhibition, Competitive, Non competitive & Uncompetitive inhibition. Irreversible inhibition, Feedback inhibition. Allosteric enzymes- properties, and models, Mechanism of action of Aspartate transcarbamylase. Covalent modification. Isoenzymes : Lactate dehydrogenase and creatine phosphokinase, Zymogens.

### **Unit IV: (15 Hours)**

**Co-Enzymes:** Definition, Structure and functions of TPP, NAD, NADP, FAD, FMN, Coenzyme A, Multienzyme Complex: Pyruvate dehydrogenase complex. Mechanism of enzyme action: General acid base catalysis, covalent catalysis, Proximity orientation. Mechanism of action of Lysozyme and chymotrypsin.



**Unit V:**

**(15 Hours)**

Enzyme Technology-Immobilized enzymes: Types and techniques of immobilization. Application of immobilized enzymes. Industrial application of enzymes and Therapeutic uses of Enzymes. Isolation and purification of enzymes – localization and extraction of free enzymes and membrane bound enzymes, methods of purification of enzymes, criteria of purity.

**TEXT BOOKS**

1. Nicholas., C. Price , (1998). **Fundamentals of Enzymology**. 2<sup>nd</sup> Edition, Oxford University Press.
2. Trevor Palmer, (2004). **Enzymes**. 5<sup>th</sup> Edition, Affiliated East –West press (P) Ltd.
3. Gary Walsh, Denis, and Headon, (2002). **Protein Biochemistry and Biotechnology**. John Wiley and Sons Ltd, USA.

**REFERENCES BOOKS**

1. 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.
2. Ashok Pandey, Colin webb, Carlos Ricardo Soccol, Christian., (2005). **Enzyme technology**, Asiatech Publishers, Inc., Delhi.
3. Chapline ,M.F. Bucke, C (1990). **Enzyme Technology**. 1<sup>st</sup> Edition, Cambridge University Press. New York.
4. Chapline, Bucke, C (1990). **Protein Biotechnology**. 1<sup>st</sup> Edition, Cambridge University Press, New York.

**Semester : I**  
**Paper Code: 17U1BCCP01**  
**Credit : 04**

**Core Practical : I**  
**Total Number of Hours : 45**  
**3Hours/ Week**

**SEMESTER I**  
**CORE - BIOCHEMISTRY PRACTICAL – I**

**I. Preparation of solution**

1. Normal, Molar, Percentage solution and calculation

**II. QUALITATIVE AND QUANTITATIVE ANALYSIS**

**A. QUALITATIVE ANALYSIS**

**1. ANALYSIS OF SUGARS**

- a) Monosaccharides-Glucose, Fructose, Galactose, Pentose.
- b) Disaccharides-Sucrose, Maltose and Lactose.
- c) Polysaccharides-Starch

**2. ANALYSIS OF AMINO ACIDS**

- a) Histidine b) Tyrosine c) Tryptophan
- d) Methionine e) Cysteine f) Arginine

**QUANTITATIVE ANALYSIS**

- a) Estimation of Aminoacid (Glycine) by Formal titration method.
- b) Estimation of Ascorbic acid by 2,6 Di Chlorophenol Indophenol Dye method.

**B. LIPID ANALYSIS [GROUP EXPERIMENTS]**

- a) Determination of Saponification number.
- b) Determination of Acid number.

**C. DEMONSTRATION EXPERIMENTS**

- a) Preparation of buffer and its pH measurements using pH meter.
- b) Separation of amino acids by paper Chromatography.
- c) Separation of amino acids by TLC.

**REFERENCE BOOKS:**

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

**Semester : I**  
**Paper Code: 17U1BCCP01**  
**Credit : 04**

**Core Practical : I**  
**Total Number of Hours : 45**  
**3Hours/ Week**

**SEMESTER II**  
**CORE - BIOCHEMISTRY PRACTICAL – II**

A).

**REFERENCE BOOKS:**

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

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

**PART – A (20 marks)**

1. Multiple choice questions

**PART – B (5 X 5 = 25 marks)**

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

**PART – C (3 X 10 = 30 marks)**

1. Any three out of five (open choice)
2. From each unit one question

**17U1BCC01**

(For the candidates admitted from 2014 Onwards)

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN  
(AUTONOMOUS)  
BIOMOLECULES**

**I B.Sc., BIOCHEMISTRY - I Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Define asymmetric carbon.
2. Write the structure of Galactose.
3. What is saturated fatty acid & give an example.
4. Define saponification number.
5. What is zwitter ion.
6. Write the structure of acidic amino acids.
7. Define nucleoside and nucleotide.
8. What is denaturation?
9. Write the sources of Vitamins A & C.
10. Write the deficiency symptoms of Vitamin K.

**PART- B (5 X 5=25)**

**Answer all questions**

11. (a) Explain mutarotation? (or)  
(b) Write the structure and importance of maltose.
12. (a) Classify the fatty acids with examples. (or)  
(b) Write the structure of cholesterol.
13. (a) Explain the reactions of amino acid with ninhydrin (or)  
(b) Describe the primary structure of protein.
14. (a) Write the structure of purines and pyrimidines (or)  
(b) Explain nucleotides in DNA.
15. (a) Write about Vitamin E (or)  
(b) Explain the structure & sources of Vitamin C

**PART- C (3 X 10=30)**

**Answer any three questions**

16. Classify the carbohydrate with examples.
17. Classify the lipids with examples.
18. Write the structural organisation of protein.
19. Explain the double helical structure of DNA.
20. Write the structure, physiological function & deficiency symptoms of Vitamin A.

**1472BCC02**

(For the candidates admitted from 2014 Onwards)

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

**ENZYMES**

**I B.Sc., BIOCHEMISTRY - II Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Define Katal.
2. Define enzyme specificity.
3. List out the factors affecting enzyme activity.
4. Define Km.
5. What is acid base catalysis.
6. Write the structure of TPP.
7. Define competitive inhibition.
8. What is feedback inhibition?
9. Define immobilisation.
10. Write any two applications of immobilised enzymes.

**PART- B (5 X 5=25)**

**Answer all questions**

11. (a) Explain coenzyme and holoenzyme? (or)  
(b) Write a notes on enzyme specificity.
12. (a) Describe the . factors affecting enzyme activity (or)  
(b) MM Plot.
13. (a) Write the structure & functions of NAD (or)  
(b) Write a notes on acid base catalysis, covalent catalysis.
14. (a) Explain about competitive inhibition. (or)  
(b) write the mechanism of action of aspartate transcarbamylase.
15. (a) Write a short notes types of immobilised enzymes. (or)  
(b) Write in detail about industrial production of amylase.

**PART- C (3 X 10=30)**

**Answer any three question**

16. Classify enzymes with examples.
17. Derive MM equation.
18. Explain the mechanism of action of chymotrypsin.
19. Write about multienzyme complex.
20. Write a notes on industrial uses of enzymes.

**Semester: III**  
**Paper Code: 17U3BCC03**  
**Credit : 05**

**Core Paper : III**  
**Total Number of Hours : 60**  
**5 Hours/ Week**

## **BIOCHEMICAL TECHNIQUES**

**Objectives:** On successful completion of the course the students would have learnt the principles and applications of the instruments. -GM Counter, Solid and liquid Scintillation. Autoradiography and its applications,

### **UNIT – I (12 Hours)**

General principles of Biochemical investigation, *invivo* and *invitro* studies-organ and tissue slice techniques, buffer solution and media for tissue homogenization and separation. Methods of cell disruption, basic principles of Cell culture, cryopreservation, cell sorting, counting.

### **UNIT - II (12 Hours)**

Centrifugation techniques: Basic principles of sedimentation, types of centrifugation, types of centrifuges. Types of Rotors - swinging bucket fixed angle, vertical tube and zonal rotor. Differential, Density gradient and Analytical ultra centrifugation with applications.

### **UNIT – III (12Hours)**

Electrophoresis-Definition and Factors affecting electrophoresis, principles, instrumentation and applications of paper electrophoresis, agar gel, SDS-PAGE, and Isoelectric focusing. Chromatography-principle, materials, methods & applications of paper chromatography, TLC, Adsorption, Ion-exchange, Affinity chromatography and Molecular sieve.

### **UNIT – IV (12 Hours)**

HPLC, FPLC, GLC, and GC-MS [principles only]. Principle, Instrumentation and application of Colorimetry, Spectrophotometry, Fluorimetry and Flame photometry.

### **UNIT – V (12 Hours)**

Radioisotopic techniques: Types of radioactive decay, negatron, positron, alpha particle, Beta particle and gamma particle, rate of radioactive decay, units of radioactivity, detection and measurement of radioactivity Radio isotopes its application in biological sciences.

### **TEXT BOOKS**

1. Keith Wilson, and John Walker, (2010). **Principles and Techniques of Practical Biochemistry**. 7<sup>th</sup> Edition, Cambridge University Press. UK.
2. Avinash Upadhyaye, and Nirmalendhe Nath, (2002). **Biophysical Chemistry Principles and Techniques**. 3<sup>rd</sup> Edition, Himalaya Publishers, New Delhi.
3. Keith Wilson and Kenneth, (1994). **Goulding A Biologist Guide to Principles and Tecniques of Biochemistry**, EdWard Arnold Publishers. UK.
4. Gurdeep, R. Chatwal, and Sham, K. Anand, (2006). **Instrumental Methods of Chemical Analysis**. Himalaya publishing House, New Delhi.

### REFERENCE BOOKS

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

### WEB REFERENCES:

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>



**Semester: III**  
**Paper Code: 17U3BCS01**  
**Credit : 02**

**SBEC: 01**  
**Total Number of Hours : 48**  
**4 Hours/ Week**

### **NUTRITIONAL BIOCHEMISTRY**

#### **Objective:**

To acquire detailed knowledge regarding the biological basis of nutrition and the mechanisms by which diet can influence health. This includes a basic understanding of metabolism, physiology, molecular genetics, epidemiology and biostatistics.

#### **UNIT – I**

**07 Hours**

Introduction, Calorific value of foods. Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action. BMR, Measurement of BMR and factors influencing BMR. The daily energy requirement , importance of energy for various activities.

#### **UNIT – II**

**07 Hours**

Dietary requirements, recommended dietary allowances for infants, children and adolescent, pregnant and lactating women. Role of dietary fat, fiber, antioxidants . Proteins: Protein content of diets of people in different parts of India.

#### **UNIT – III**

**07 Hours**

Protein factor in nutrition- Quality of protein and Quantitative aspects. Essential aminoacids, Biological value of proteins and nitrogen balance. Protein calorific malnutrition – Aetiology, management of marasmus and kwashiorkor.

#### **UNIT – IV**

**07 Hours**

Minerals - Nutritional significance of dietary macro minerals (Ca,P, Mg, S, K, Na, Cl) and trace minerals. (Iron , Iodine, Zinc and copper) Disorders related to the deficiency of minerals.

#### **UNIT- V**

**07 Hours**

Nutrition and body defenses: Effect of drugs on food and nutrients, drug - nutrient interaction nutritional therapy, food preparation and management. Role of diet and nutrition in the prevention and treatment of disease.

#### **TEXT BOOKS**

1. S. Davidson and J.R. Passmore. **Human nutrition and dietetics**,
2. IS Garraw, WPT James **Human nutrition and dietetics**, 10<sup>th</sup> Edition
3. Narayanan **Food and nutrition**,
4. Whol and Good hart **Modern Nutrition in Health and Diseases**,.
5. DWS Wong **Mechanism and Theory in Food Chemistry**, CBS New Delhi, 1996.
6. Dr M.Swaminathan **Essential of food and nutrition** Volume I and II
7. David A.Bender **Nutritional biochemistry** 2<sup>nd</sup> edition(2009) Cambridge university press

**Semester: III**  
**Paper Code: 17P3BCCP03**  
**Credit : 04**

**Core Pratical-III**  
**Total Number of Hours :45**  
**3Hours/ Week**

**SEMESTER III & IV**

**SUBJECT TITLE: CORE - BIOCHEMISTRY PRACTICALS – II**

**I. COLORIMETRY**

- |                              |   |                        |
|------------------------------|---|------------------------|
| 1 .Estimation of Glucose     | - | O -T Method            |
| 2. Estimation of Fructose -  | - | Seliwanoff's Method    |
| 3. Estimation of Pentose     | - | Bial' s Method         |
| 4. Estimation of Urea        | - | DAM Method             |
| 5 .Estimation of Cholesterol | - | Zaks Method            |
| 6. Estimation of Protein     | - | Biuret Method          |
| 7 .Estimation of Phosphorus  | - | Fiske Subbarow Method. |

**REFERENCES**

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

**Semester: IV**  
**Paper Code: 17U4BCC04**  
**Credit : 05**

**Core Paper : IV**  
**Total Number of Hours : 75**  
**5Hours/ Week**

## **INTERMEDIARY METABOLISM**

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

### **UNIT – I (12 Hours)**

Biological oxidation: Introduction, Enzymes in biological oxidation, Redox potential, Electron Transport Chain & its inhibitors, structure of ATPase complex, chemiosmotic theory, Oxidative phosphorylation & its inhibitors, Mitochondrial shuttle system.

### **UNIT – II (13 Hours)**

Carbohydrate Metabolism: Introduction, glycolysis, TCA cycle, and its energetics. Glycogen metabolism: Glycogenesis & Glycogenolysis, Alternative pathways: HMP pathway, gluconeogenesis, glyoxylate cycle and its importance.

### **UNIT – III (12 Hours)**

Lipid Metabolism: Introduction, Oxidation of fatty acids (alpha, beta, omega oxidation). Denovo synthesis of Fatty acid, Biosynthesis of cholesterol, Biosynthesis of TG, Phospho lipids (Phosphatidyl serine, Phosphatidyl ethanolamine), Metabolism of ketone bodies.

### **UNIT – IV (13 Hours)**

Protein Metabolism: Degradation of proteins – Deamination, Transamination & Decarboxylation. Transport of ammonia. Urea cycle. Catabolism of carbon skeleton of amino acids (Alpha Keto Glutarate, Pyruvate, Aromatic amino acids) . Interrelation between carbohydrates, fat and protein metabolism.

### **UNIT-V (10 Hours)**

Nucleic acid Metabolism: Introduction, Biosynthesis & degradation of purine and pyrimidine nucleotides, inhibitors of nucleic acid metabolism.

### TEXT BOOKS

1. Nelson, David, L. and Cox, (2008). **Lehninger Principles of Biochemistry**. 5<sup>th</sup> Edition, W.H. Freeman and Co., New York.
2. Donald Voet, Judith, G. Voet, and Charlotte, W Pratt, (2008). **Fundamentals of Biochemistry**, 3<sup>rd</sup> Edition. John Wiley & Sons, New Jersey.
3. Eric, E. Conn, P.K. Stumpf, G. Brueins, and Ray, H. Doi, (2005). **Outlines of Biochemistry**. 5<sup>th</sup> Edition, John Wiley and sons, Singapore.
4. Lubert Stryer, (1995). **Biochemistry**. 4<sup>th</sup> Edition . WH freeman and co, Sanfrancisco.
5. Thomas, M. Devlin, (1997). **Text book of Biochemistry**. 4<sup>th</sup> Edition A John Wiley, Inc Publication, New York.
6. Zubay G L, (1988). **Biochemistry**. 4<sup>th</sup> Edition . W M C Brown Publishers, USA.

### REFERENCE BOOKS

1. Devlin, T.M. (2002) **Textbook of Biochemistry with Clinical Correlations**. John Wiley and sons, INC. New York.
2. Bowsher, C, Steer, M. and Tobin, A (2008). **Plant Biochemistry**. Garland Science, Taylor and Francis Group, LLC. New York.
3. Robert Murray, Bender, (2012) Harper's **Illustrated Biochemistry**. McGraw Hill.

### WEB REFERENCES

1. [www.britannica.com/science/glyoxylate-cycle](http://www.britannica.com/science/glyoxylate-cycle)
2. <https://www.uic.edu/classes/phar/.../transaminationofaminoacid.htm>
3. [www.slideshare.net/YESANNA/transamination-deamination](http://www.slideshare.net/YESANNA/transamination-deamination)
4. <http://krebbling.blogspot.in/2006/12/glyoxylate-cycle.html>
5. [www.chem4kids.com/files/bio\\_nucleicacids.html](http://www.chem4kids.com/files/bio_nucleicacids.html)

**Semester: V**  
**Paper Code: 17U4BCS02**  
**Credit : 05**

**SBEC : II**  
**Total Number of Hours : 35**  
**3 Hours/ Week**

### **BIOCHEMISTRY IN DIAGNOSTIC MEDICINE**

#### **Objective:**

After the completion of this course the student would have understood. The aim and objective of various clinical laboratory test. The significance of various test and interpretation in diseased conditions.

#### **Unit I**

**5 Hours**

**Laboratory Care and Instrumentation:** Code of conduct for laboratory personnel - safety measures in the laboratory-chemical/Reagents, labeling, storage and usage. First Aid in laboratory accidents - Precautions and first aid equipments. Reporting laboratory tests and keeping records. General approach to quality control, Internal and External quality control.

#### **Unit II**

**5 Hours**

**Blood Banking:** Blood grouping- ABO System, ABO Grouping, Rh typing,. Coomb's test, Blood transfusion - Blood donors, donor screening, drawing of blood, compatibility testing, cross matching, blood transfusion complications.

#### **Unit III**

**5Hours**

**Clinical Hematology:** Collection of blood - Anticoagulant, preservation, Estimation of Glycosylated haemoglobin, PCV, WBC, RBC, Platelets, ESR. Clotting time, bleeding time - normal value and clinical interpretation.

#### **Unit IV**

**5 Hours**

**Urine Analysis:** Composition, collection, preservation, gross examination, interfering factors and chemical examination. Significance of sugar, ketone bodies, bile pigments, hematuria, uric acid in urine. Microscopic examination of the urinary sediment and hematuria

**Stool Examination:** Specimen collection- inspection of faeces- odour, pH, Interfering substance. Test for occult blood, faecal fat, microscopic examination of stool specimen.

**Unit V**

**5 Hours**

**Body fluids:** Cerebrospinal fluid Composition and Analysis. Semen analysis, sputum examination, pregnancy test - Interpretation.

**Endocrine function test:** Laboratory methods of evaluation of endocrine disorder- Thyroid function test, Clinical disorder- diagnosis of T<sub>4</sub>, I<sup>131</sup> uptake, TSH Stimulation test.

**TEXTBOOKS**

1. Ramnik Sood **Laboratory practices in CMC procedure**, Clinical CMC, Vellore.
2. Sabitri sanyal-(1991), **Text book of pathology**, first edition,
3. June H.cella- (1994), **manual of laboratory test**, AITBS publishers.
4. Kanai L.Mukherjee, **Medical Laboratory Technology** Vol. I.Tata McGrawHill 1996,New Delhi.
5. GradWohl, **Clinical Laboratory-methods and diagnosis**,Vol-I
6. SabitriSanyal, B.I.Churchill **Clinical pathology**, Livingstone(P)Ltd, New Delhi.2000.
7. Judith Ann Lewis, **Illustrated guide to diagnostic tests**-students version,Springhouse Corporation, Pennsylvania, 1994.
8. M.N. Chatterjee and Rane Sinde **Text book of medical Biochemistry**

**REFERENCE**

1. L. Mukherjee **Medical Laboratory Technology** -Vol. I, II, III. Tata Mcgraw - Hill Publishing Company Limited
2. V.H. Talib **Medical Laboratory Technology**
3. A. John Wiley- Thomas M. Devlin, **Text book of Biochemistry with clinical correlation**, 3<sup>rd</sup> edition, Liss Inc. Publication
4. Harold Varley, **Practical Clinical Biochemistry**, 4<sup>th</sup> Edition, CBS Publication and Distributors, New Delhi.
5. Harrison T.R. Fauci, Braunwald, Isselbacher **Principles of Internal Medicine**, Volume I and II 14<sup>th</sup> Edition, MC-graw hill, Newyork.
6. Tietz **Fundamentals of Clinical Chemistry**- (5th edition) C.A. Burtis, E.R. Ashwood (eds) Saunders WB Co

**Semester: IV**  
**Paper Code: 17P4BCCP04**  
**Credit : 04**

**Core Practical-II**  
**Total Number of Hours :45**  
**3Hours/ Week**

## **SEMESTER IV**

### **I. PREPARATION:**

1. Starch from Potato
2. Lecithin from Egg Yolk
3. Casein from Milk

### **II. ENZYME ASSAY**

Determination of effect of pH, temperature and substrate concentration of following enzyme

1. Alkaline phosphatase
2. Salivary Amylase
3. Acid phosphatase

### **REFERENCES**

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

**B.Sc., BIOCHEMISTRY**  
**QUESTION PAPER PATTERN**

**MAXIMUM MARKS – 75 marks**

**DURATION – 3 hours**

**PART – A (20 marks)**

1. MCQs

**PART – B (5 X 5 = 25 marks)**

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

**PART – C (3 X 10 = 30 marks)**

1. Any three out of five (open choice)
2. From each unit one question



(For the candidates admitted from 2014 Onwards)

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

**Biochemical Techniques**

**I B.Sc., BIOCHEMISTRY - III Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Define Buffer
2. Define cryopreservation
3. List out the types of Rotor
4. Write any two applications of Density gradient centrifugation
5. Define Electrophoresis
6. Write the principle of Affinity chromatography
7. Write the principle Colorimetry
8. Write any two applications of Fluorimetry
9. Write the units of Radio activity
10. Define Ionization

**PART B (5 X 5 = 25 Marks)**

**Answer ALL Questions.**

11. a. Write short note on organ and tissue slice technique (or)  
b. Describe the methods of Cell disruption
12. a. Write short note on swinging bucket rotor and Fixed angle rotor (or)  
b. Give an overview of Differential centrifugation
13. a. Explain about Paper electrophoresis (or)  
b. Write in detail about GLC
14. a. Write in detail about Flame photometry (or)  
b. Write in detail about Fluorimetry
15. a. Write short note on Radioactive Decay (or)  
b. Explain about Solid scintillation counting

**PART C (3 X 10 = 30 Marks)**

**Answer Any THREE Questions.**

16. Write a brief note on Organ slice technique
17. Describe in detail about Density gradient centrifugation
18. Explain the technique of SDS- PAGE
19. Explain the Principle, Instrumentation of Spectrometry
20. Write a note on Autoradiography

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

**INTERMEDIARY METABOLISM**

**II B.Sc., BIOCHEMISTRY - IV Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Define Redox potential
2. Define Oxidative phosphorylation
3. Define Glycogenesis
4. Write importance of Glyoxylate cycle
5. Define Beta oxidation of Fatty acid
6. Write the structure of Cholesterol
7. Define Deamination with examples
8. List out Glucogenic aminoacids
9. Write the structure of Adenine
10. Write any two inhibitors of Nucleic acid metabolism

**PART B (5 X 5 = 25 Marks)**

**Answer ALL Questions.**

11. a. Write a short note on Enzymes in biological oxidation (or)  
b. Describe the Structure of ATPase complex
12. a. Explain the energetics of Glycolysis (or)  
b. Give a note on Glycogenolysis
13. a. Explain alpha oxidation (or)  
b. Write the biosynthesis of TG
14. a. Write a short note on deamination & decarboxylation (or)  
b. Write a short note on inter relation between carbohydrate, fat & protein metabolism
15. a. Explain degradation of purine (or)  
b. Give a note on inhibitors of nucleic acid metabolism

**PART C (3 X 10 = 30 Marks)**

**Answer Any THREE Questions.**

16. Explain ETC
17. Explain Glycolysis
18. Write a note on metabolism of ketone bodies
19. Explain Urea cycle
20. Write the biosynthesis of pyrimidine nucleotides

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

**PLANT BIOCHEMISTRY**

**II B.Sc., BIOCHEMISTRY - III Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Define ascent of sap
2. Define Transpiration
3. Define Photosynthesis
4. Define CAM plants
5. Define Symbiotic nitrogen fixation
6. Define Nitrogen cycle
7. Define Auxin
8. Write about Physiological affect of ethylene.
9. Write medicinal value of any two medicinal plants
10. Define Secondary metabolites

**PART B (5 X 5 = 25 Marks)**

**Answer ALL Questions.**

11. a. Write Short note on Symplast and apoplast (or)  
b. Write about Ascent of Sap
12. a. Write Short note on Photosynthetic apparatus (or)  
b. Give short note on Calvin cycle Hatch Slack Cycle
13. a. Explain carbon cycle. (or)  
b. Explain about Phosphorous cycle
14. a. Write about Gibberellins (or)  
b. Explain about biosynthesis of ABA
15. a. Write Short note on secondary metabolites (or)  
b. Explain about medicinal value of Amla and Stevia.

**PART C (3 X 10 = 30 Marks)**

**Answer Any THREE Questions.**

16. Explain mechanism of water absorption
17. Explain Calvin cycle
18. Explain about Biochemistry of symbiotic nitrogen fixation
19. Explain Physiological function of all growth hormones
20. Write about the role of secondary metabolites in ayurveda and Siddha Treatment

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

**NANOCHEMISTRY**

**II B.Sc., BIOCHEMISTRY - IV Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**PART- A (10 X 2=20)**

**Answer all questions**

1. Carbon nanotubes (CNT)
2. Nano peapods
3. Organic nanoparticles
4. Mention any 2 plants based nanoparticles
5. Cyclodextrin
6. Dendrimer
7. Examples of nano emulsion bacteria
8. Any two application of nanotechnology for the treatment
9. Nanomedicine
10. Mention any 2 Microbial based nanoparticles

**PART B (5 X 5 = 25 Marks)**

**Answer ALL Questions.**

11. a. Write Short note on Polymer based nanostructure (or)  
b. Write about Protein based nanostructure
12. a. Write Short note on preparation of organic nano particles (or)  
b. Give short note on separation of nano particles
13. a. Explain about nano emulsion using bacteria (or)  
b. Explain about Plant based nano particles synthesis
14. a. Write about nano medicines based on organic nano particles (or)  
b. Explain about Drug delivery
15. a. Write Short note on available application of nano particles (or)  
b. Explain about manufacturing of nano particles

**PART C (3 X 10 = 30 Marks)**

**Answer Any THREE Questions.**

16. Explain drug deliver by nano particles
17. Explain manufacturing of nano particles
18. Explain about characterization and imaging of organic nano particles
19. Discuss about application of organic nano particles
20. Write about Protein based organic nano particles in nano medicine

**Semester: V**  
**Paper Code: 17U5BCC05**  
**Credit : 05**

**Core Paper : V**  
**Total Number of Hours : 60**  
**5Hours/ Week**

## **HUMAN PHYSIOLOGY & NEUROCHEMISTRY**

### **Objective:**

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

### **Unit I**

**12 Hours**

**Digestive System:** Secretions of digestive tract, digestion, absorption, assimilation of carbohydrates, proteins, fats, nucleic acids, vitamins and minerals.

### **Unit II**

**12 Hours**

**Blood Composition and function:** Red blood cells, Hemoglobin, white blood cells and platelets. Blood composition and function. Tidal volume, Vital Capacity, ERV, IRV.

**Respiratory System:** Transport and exchange of gases between lungs and tissues, Mechanism of blood coagulation.

### **Unit III**

**12 Hour**

**Cardiac system:** Types, functions and physiology of muscle contraction, physiology of cardiac muscle, cardiac cycle and the regulation of heart pumping, ECG and blood pressure.

### **Unit IV**

**12 Hour**

**Urogenetal System :** Structure and function of kidney, Nephron, Mechanism of urine formation, outline of structure and function of the male and female reproductive organs, spermatogenesis, menstrual cycle, physiology of pregnancy, parturition and lactation.

### **Unit V**

**12 Hour**

**Nervous System:** Classification of nervous system, characteristics of sympathetic and parasympathetic function. Structure of neuron, resting potential and action potential, Propagation of nerve impulses, Structure of synapse, synaptic transmission.

### **TEXTBOOKS**

- A.C. Guyton (1996) **Text book of medical physiology**, 10<sup>th</sup> Edition.
- Guyton **Text book of human physiology**
- C.Chatterjee **Text book of medicinal chemistry**
- Chatterjee A.C (2004) **Human Physiology**,. Volume I & II. 11<sup>th</sup> Edition Medical agency allied, Calcutta

### **REFERENCE**

- William. F. Ganong, (2003) **Review of Medical Physiology**, 14<sup>th</sup> Edition, A Lange Medical book.
- M.M.Muthiah **Text book of biochemistry, Lecture notes on human physiology Vol II** 1991.
- Gerard J Tortora and Bryan derrickson **Principles of anatomy and physiology**, 14 th Edition.
- Gerard J Tortora and Bryan derrickson **Introduction to the human body** 14 th Edition

**Semester: V**  
**Paper Code: 17U5BCC07**  
**Credit : 05**

**Core Paper : VII**  
**Total Number of Hours : 60**  
**5Hours/ Week**

## MOLECULAR BIOLOGY

### Objective:

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

### Unit I

**12 Hours**

**Cell and cellular components:** Structure of prokaryotes and eukaryotic cells. Double helical Structure and function of DNA and Structure and types of tRNA, rRNA, mRNA. DNA as genetic material. Central dogma of molecular biology.

### Unit II

**12 Hours**

**Replication:** Semiconservative replication, experimental evidence for semi conservative replication, Bidirectional replication theta model and rolling circular model. replication in prokaryotes- enzymes involved in replication, mechanism of replication , inhibitors of replication.

### Unit III

**12 Hours**

**Transcription:** RNA polymerases, role of sigma factor, initiation, elongation and termination. (Rho - dependent and independent). Inhibitors of transcription, post transcriptional modification in prokaryotes. Processing of mRNA and tRNA, reverse transcription. Basic concept of one gene - one enzyme hypothesis.

### Unit IV

**12 Hours**

**Translation:** Composition of prokaryotic and eukaryotic ribosome, Initiation, elongation and termination of protein synthesis in prokaryotes. Inhibitors of protein synthesis. Post translational modification of proteins. Genetic code - definition, deciphering and silent features of the genetic code, coding and non coding strands of DNA, role of signal peptides.

**Unit V**

**12 Hours**

**Mutation:** Spontaneous and induced, Point mutation, transition transversion frame shift, insertion and deletion. **DNA Repair Mechanism:** Mismatch, Excision, SOS and UV repair.

**Regulation of Gene Expression:** Operon Concept- Lac Operon-Positive and negative control

**TEXT BOOKS**

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

**REFERENCE BOOKS**

1. David Friefelder, (1987). **Molecular biology**. 2<sup>nd</sup> Edition, Narosa Publishing House, New Delhi.
2. E D P de Robertis and E M F de Robertis, (2001). **Cell and Molecular Biology**. 8<sup>th</sup> Edition, Lippincott W&W.
3. Weaver, R.F.(2005). **Molecular Biology**. 3<sup>rd</sup> Edition. Tata Mc Graw - Hillcompanies, Inc India.
4. Harvay Harvay Lodish, Arnold Berk, David Baltimore and James Darnell (2000) **Molecular Cell Biology** 4<sup>th</sup> Edition N.H Freeman New york



**Semester: V**  
**Paper Code: 17U5BCE01**  
**Credit : 05**

**Elective: I**  
**Total Number of Hours : 60**  
**5 Hours/ Week**

## **DRUG BIOCHEMISTRY**

### **Objective:**

On successful completion of the course the students should have: Understood the development of the traditional and modern methods used for drug discovery; of how molecules interact. Understanding the mode of action of a drug, and the method by which it can be synthesized, and developed.

### **Unit I**

**12Hours**

**Introduction:** History of Drugs, Classification of drugs, routes of drug administration, absorption and distribution of drugs, Site of action, Drugs distribution and elimination, Role of kidney in elimination. Introduction to nanomedicine.

### **Unit II**

**12Hours**

**Drug Metabolism:** Chemical pathways of drug metabolism. Phase I and Phase II reactions, role of cytochrome P450, non-microsomal reactions of drug metabolism, drug metabolising enzymes.

### **Unit III**

**12Hours**

**Chemotherapy:** Biochemical mode of action of antibiotics- penicillin and chloramphenicol. Action of alkaloids, antiviral and antimalarial substances. Biochemical mechanism of drug resistance.

### **Unit IV**

**12Hours**

**Adverse Responses and Side Effects of Drugs:** Allergy, Drug intolerance, Drug addiction, drugs abuses and their biological effects and drug dependence.

### **Unit V**

**12Hours**

**Anaesthetics:** General and local, gaseous anaesthetics, ether and vinyl ether, halogenated hydrocarbons like chlorofom, intravenous anaesthetics thropentanesodium and cocaine. Antispetics and disinfectants - Phenols and related compounds, formaldehyde and ethanol. Organic pharmaceuticals - their role as preservatives and food additives.

**TEXT BOOKS**

1. Willam.O.Foye, (1995) **Principles of Medicinal Chemistry** 4<sup>th</sup> Edition Waverks Pvt. Ltd. New Delhi
2. R.S.Satoskar. S.D.Bhandhakar **Pharmacology and Pharmacotherapeutics** -Popular Prakashar Bombay.
3. Katzung **Clinical Pharmacology** Basic and 7<sup>th</sup> Edition Printice Hall, New Delhi
4. Goodman And Gillman **The Pharmacology** Vol I and II- Mc Graw Hill

**REFERENCE BOOKS**

1. Burger's **Medicinal Chemistry and Drug Discovery**: principles and practice – Wolf, John Wiley
2. Glick, Pasternak, (2002) **Molecular Biotechnology** 2<sup>nd</sup> Edition ak, Panima Publishers,
3. Davies, s, **Molecular Basis of Inherited Diseases** Read, IRL Press
4. Rang, Tale **Pharmacology** 3<sup>rd</sup> Edition
5. Goodman And Gillman, **The Pharmacology** Vol I and II, Mc Graw Hill

**Semester: V**  
**Paper Code: 17U5BCN01**  
**Credit : 03**

**SBEC-I**  
**Total Number of Hours : 30**  
**2 Hours/ Week**

### **PLANT BIOCHEMISTRY**

**Objectives:** On successful completion of the course the students should have understood the components of culture media and various tissue culture techniques.

#### **UNIT - I (6 Hours)**

Plant cell wall, Mechanism of water absorption, Ascent of sap, Osmosis and Imbibition, Concept of Transpiration-types, stomatal opening, Mechanism and factors affecting transpiration.

#### **UNIT - II (6 Hours)**

Photosynthesis – Photosynthetic apparatus, Photosynthetic pigments, Biochemistry of dark and light reaction. Calvin cycle, Hatch – Slack cycle, CAM plants.

#### **UNIT - III (6 Hours)**

Biogeochemical Cycles- Nitrogen cycle, Biochemistry of symbiotic and nonsymbiotic nitrogen fixation, Sulphur cycle, Phosphorus cycle. Carbon cycle.

#### **UNIT – IV (6 Hours)**

Plant growth regulators – Chemistry, biosynthesis, mode of action, distribution and physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene.

#### **UNIT - V (6 Hours)**

Biosynthesis and function of Secondary metabolites(Alkaloids, Flavonoids, Terpenes), Medicinal value of different parts of plants. Role of secondary metabolites in Ayurvedha and Sidha treatment. Medicinal value of Amla, Stevia, Aswagandha and Turmeric.

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

### WEB REFERENCES:

[www.biology4kids.com/files/plants\\_photosynthesis.html](http://www.biology4kids.com/files/plants_photosynthesis.html)

1. [www.slideshare.net/BiologyIB/photosynthesis-powerpoint-3983595](http://www.slideshare.net/BiologyIB/photosynthesis-powerpoint-3983595)
2. [http://www.slideshare.net/shivam\\_hayabusa/production-of-secondary-metabolites](http://www.slideshare.net/shivam_hayabusa/production-of-secondary-metabolites)
3. [www.slideshare.net/JonathanOLEary/photosynthesis-power-point](http://www.slideshare.net/JonathanOLEary/photosynthesis-power-point)
4. <https://en.wikipedia.org/wiki/Photophosphorylation>
5. [www.uic.edu/classes/bios/bios100/lectures/photorespiration.htm](http://www.uic.edu/classes/bios/bios100/lectures/photorespiration.htm)

[http://plantphys.info/plant\\_physiology/photoresp.shtml](http://plantphys.info/plant_physiology/photoresp.shtml)

**Semester: V**  
**Paper Code: 17U5BCS03**  
**Credit : 05**

**SBCE: III**  
**Total Number of Hours : 60**  
**5 Hours/ Week**

## **BIOINFORMATICS**

### **Objective:**

The course structure emphasizes enough effort on theory work so as to have fundamentals clear and strengthened. It is essential for the students to read research papers and deliver seminars that would help them to know the recent advances in the subject and also develop the communication skills.

### **Unit I**

**12 Hours**

**Bioinformatics:** Introduction to Bioinformatics, History, Current Status of Bioinformatics, tasks of Bioinformatics, Problems and Scope of Bioinformatics. Role of internet.

### **Unit II**

**12 Hours**

**Data Bases:** Biological Database, Sequence and structural database- Protein data base, Nucleic acid sequence data bases (NCBI, EMBL, DDJB), Protein sequence data base-SWISS-PROT, Tr EMPL, Specialized database-Search retrieval tools- Entrez, SRS. data base searching – BLAST.

### **Unit III**

**12 Hours**

**Local Global Alignments:** Pairwise alignment- BLAST, FASTA. Multiple alignment- Cluster analysis phylogenetics – CLUSTAL & UPGAMAS. (Cladogram, Dendrogram definition) Phylogenetic analysis –Genetic defence. Phylogenetic tree.

### **Unit IV**

**12 Hours**

**Protein Prediction:** Secondary structure prediction- Neural network methods, Nearest neighbor method, Molecular visualization tools - Rasmol, Swissport.

### **Unit V**

**12 Hours**

**Drug Discovery:** Role of bioinformatics in drug discovery cheminformatics microarray, docking and prediction of drug quality, ADMET Principle. Computer aided drug design.

### TEXT BOOKS

1. S,C Rastogi ,Namitamendritta,Paragrastogi (2000). **Bioinformatics-concepts, Skill and Application Genomic and proteomics** Functional and computational Aspects– sandarsunai
2. Hubert Rehn, **Protein Biochemistry and Proteomics**(2006). Academic press
3. Harshawaedhan .P.Bal **Bioinformatics** Principles and Application
4. JanuszM.Bujnicki (2008) **Practical Bioinformatics** Springer Berlin

### REFERENCE BOOK

1. MountDavit. 2<sup>nd</sup> Edition **Bioinformatics sequence and genome analysis**
2. S.pennington (2002) **Proteomics: Fromprothin sequene to function**
3. Bryan Bergeron(2003) **Bioinformatics computing**
4. Royston Goodacre -**Metabolomics**

## NANOCHEMISTRY

**Objectives:** About the nano particles and its applications in the various fields

### Unit I (7 Hours)

**Nanomaterial:** Introduction to Nanostructures, Carbon Nanotubes (CNT), Graphenes, Fullerenes, Nano Peapods, Metal-based Nanostructures (Iron 2 Oxide Nanoparticles) Nanowires, Polymer-based Nanostructures, Protein-based Nanostructures.

### Unit II (8 Hours)

**Organic Nanoparticles:** Introduction, definition, structure, types of NP, analytical methods (Extraction and isolation, Separation, Characterization and Imaging), general method of preparation, properties, detection, and characterization of organic nanoparticles

### Unit III (6 Hours)

**Nano particles and Microorganisms:** Microbial Synthesis of Nano materials, Biological Methods for Synthesis of nano-emulsions using bacteria, Fungi and Actinomycetes, Plants based nanoparticle synthesis.

### Unit IV (7 Hours)

**Application of Organic Nanoparticles:** Application of Lipids, CNTs, Proteins, peptides, Dendrimer, cyclodextrin, Polysaccharide based organic nanoparticles in nanomedicine and drug delivery.

**Unit V**

**(7Hours)**

**Nanotechnology in Drug Delivery:** Introduction, Manufacturing of Nanoparticles, Nanoparticles, Drug deliveries, Drug delivery system, Nanoparticle in Drug delivery Available applications, Nanotechnology future application for treatment.

**TEXT BOOKS**

1. **Introduction to Nan science** Gabor L. Hornyak, Joydeep Dutta, Harry F. Tibbals, Anil K. Rao (2008) by CRC Press.
2. **Nanotechnology: Importance and Application** M.H. Fulekar (2010) by IK International Publication.
3. **Nanomaterials for Biosensors** Challa Kumar (2007) by Wiley-VCH

**REFERENCE BOOKS**

1. **Nanotechnology: Health and Environmental risk** Jo Anne Shatkin(2008) by CRC press.
2. ) **Nanotechnology in Biology and Medicine:** Tuan Vo-Dinh (2007) Methods, Devices and Application by CRC press.
3. **Nanotechnologies, Hazards and Resource Efficiency** M. Steinfeldt, Avon Gleich, U. Petschow, R. Haum. Springer (2007) by CRC press.

**WEB REFERENCES**

1. [www.nanocyl.com/jp/CNT-Expertise-Centre/Carbon-Nanotubes](http://www.nanocyl.com/jp/CNT-Expertise-Centre/Carbon-Nanotubes)
2. [www.nanowerk.com/.../](http://www.nanowerk.com/.../)
3. [www.mdpi.com/journal/nanomaterials](http://www.mdpi.com/journal/nanomaterials)
4. [www.hindawi.com/journals/jnm/](http://www.hindawi.com/journals/jnm/)
5. [www.crnano.org/whatis.htm](http://www.crnano.org/whatis.htm)
6. [www.asme.org/nanotechnology](http://www.asme.org/nanotechnology)

**Semester: V**  
**Paper Code: 14U5BCCP05**  
**Credit : 04**

**Core practical: V**  
**Total Number of Hours :45**  
**5 Hours/ Week**

**CORE PRACTICALS – V**

1. Preparation of media – liquid, solid, slant culture
2. Culture techniques – streak plate, pour plate, and spread plate.
3. Simple staining of Bacterial pure culture
4. Gram staining of Bacterial pure culture.
5. Identification of microbes – biochemical tests ( IMVIC test)
6. Immunodiffusion – single and double diffusion
7. Immunoelectrophoresis
8. Sub cellular fractionation of organelles and purity checking
9. Restriction digestion
10. Isolation of plasmid DNA and separation by electrophoresis
11. Isolation and separation of Genomic DNA from animal tissues

**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.



**Semester: VI**  
**Paper Code: 14U5BCCP03**  
**Credit : 04**

**Core practical: VI**  
**Total Number of Hours :45**  
**5 Hours/ Week**

### **CORE PRACTICALS – VI**

#### **I. PLANT TISSUE CULTURE**

1. Media preparation
2. Callus induction
3. Micropropagation

#### **II. GENETIC ENGINEERING**

1. Restriction Digestive Enzymes identification
2. Isolation of Plasmid DNA and Separation in Electrophoresis
3. Isolation of genomic DNA

#### **III. IMMUNOLOGY**

1. Single [Radial] Immunodiffusion
2. Double [Outcherlony] immunodiffusion
3. Immunoelectrophoresis

#### **IV. MICROBIOLOGY**

1. Sterilization : Wet and Dry methods
2. Preparation of Agar and broth media [Slant and plate]
3. Culture Techniques: Streak, Pour and Spread plate
4. Enumeration of microbes from soil, air and water
5. Staining techniques: Simple and Gram's staining
6. Identification of microbes by Biochemical tests [all tests]

#### **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

**Semester: VI**

**Paper Code: 17U6BCC08**

**Credit : 05**

**Core Paper: VIII**

**Total Number of Hours : 60**

**5 Hours/ Week**

## **IMMUNOLOGY**

### **Objective:**

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

### **UNIT-I**

**12 Hours**

**Introduction to Immunology:** Immunity, types, mechanism of immunity, immune response, types, cells involved in immune response. Primary and secondary lymphoid organs. Structure and function of T, B and NK cells.

### **UNIT-II**

**12 Hours**

**Antigens And Antibody:** Properties, Specificity, Immunogenicity, antigenic determinants, haptens, adjuvant. Properties, Structure, Classes and Subclasses of Immunoglobins, Monoclonal antibodies - Production and applications. Complement component. Cytokines and their junctions.

### **UNIT-III**

**12 Hours**

**Antigen Antibody interactions:** Agglutination, Precipitation, Complement fixation, and Neutralization, Opsonization. Immunofluorescence, ELISA and RIA. Immuno electrophoresis and electro immuno diffusion.

### **UNIT-IV**

**12 Hours**

**Hypersensitivity Types – I to V,** Immuno Disease: Rheumatoid arthritis, Myasthenia gravis. Skin Test: Montex and Penicillin test.

### **UNIT-V**

**12 Hours**

**Transplantation Immunology:** MHC, HLA- mechanism of graft acceptance and rejection, immune suppressors, auto immunity, Auto immune disorders and immune deficiency disorders with special reference to AIDS. Recombinant vaccines: DNA vaccines. Benefits and adverse effects of vaccination.

### **TEXT BOOKS**

1. Tizard(1984). **An Introduction Immunology**: Tizard K, Saunders college Publishing
2. 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, NewYork.
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, NewYork.
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). **Immunology** J.R. Paul 4<sup>th</sup> Edition. Black well Scientific Publishers,
4. Virella, (1999) **Introduction to Medical immunology** 4<sup>th</sup> Edition, , Marcel Dekker Ltd.,

**Semester: VI**  
**Paper Code: 17U6BCC09**  
**Credit : 05**

**Core Paper: IX**  
**Total Number of Hours : 75**  
**5 Hours/ Week**

## **ENDOCRINOLOGY**

### **OBJECTIVE:**

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

### **UNIT – I**

Introduction, classification of hormones. Role of second messengers in hormonal action. Cyclic AMP, Role of G-proteins. Calcium, calmodulin. Mechanism of action of Group I and Group II hormones. Hormones of the hypothalamus Anterior Pituitary hormone(Tropic hormone)-Posterior Pituitary (Oxytocin, Vasopressin)

### **UNIT – II**

Hormones of the thyroid & parathyroid-chemical nature, secretion, function & disorders of thyroid & parathyroid hormones. Calcitriol biosynthesis and functions. Hyper and hypocalcemia. Hyper and hypoparathyroidism, Paget's disease, Ricket's and osteomalacia.

### **UNIT – III**

Pancreatic & G.I. Tract hormones Chemical nature & functions of Insulin, Glucagon. Secretion, release, chemical nature and functions of Gastrin, Enterogastin, Secretin & Cholecystokinin.

### **UNIT – IV**

Hormones of the Adrenal gland – chemical nature & functions of Adrenal medullary & Cortex hormones. Adrenal Corticoid hormones- Glucocorticoids, Mineralocorticoids- synthesis and biological effects. Adrenal medullary hormones-Catecholamines: biosynthesis and biological effects.

### **UNIT – V**

Gonadal hormones- Androgens and estrogens. Hormones of the testes and ovaries – chemical nature & functions of Androgens, Estrogens and Progesterone.

**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.
3. Donald Voet , Judith G. Voet , Charlott W. Pratt , , **Fundamentals of Biochemistry** upgrade edition John Willey & Sons. Inc,

**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.
3. Francis Sreenspan , Gordon J. 1997– **Basic & Clinical Endrocrinology** 5th Ed., Strewler Prentice – Hall International Inc.

**Semester: VI**

**Paper Code: 17U6BCS02**

**Credit : 05**

**SBEC: IV**

**Total Number of Hours : 30**

**5 Hours/ Week**

## **GENETIC ENGINEERING**

**Objective:** On successful completion of the course the student should have Understood the basics, vectors, methods of gene cloning. Techniques and application of gene technology.

### **UNIT – I**

**6 Hours**

Introduction to genetic engineering: Basic steps of gene cloning, enzymes used in genetic engineering. Basis of gene cloning; Restriction endonucleases – Types and Features; Ligations; Linkers and Adaptors.

### **UNIT – II**

**6 Hours**

Cloning vectors: Plasmids, Cosmids, Phages, Phagemids, Yeast vectors, Shuttle vectors, Ti Plasmids and Ri plasmids. Hybridization probes- Southern, Northern and Western blotting techniques.

### **UNIT – III**

**6Hours**

Methods of gene transfer. Isolation and purification of cellular and plasmid DNA, Methods for labeling nucleic acids and probes. Transformation and transfection

### **UNIT – IV**

**6 Hours**

Amplification of DNA by PCR technique and applications, *in situ* hybridization, analysis of DNA, RNA Marker and Reporter genes. Importance of Fusion proteins.

### **UNIT – V**

**6 Hours**

Applications of gene technology- Recombinant insulin and Recombinant growth hormones production . Transgenic plants and animals, Gene therapy-Methods and applications

**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. **Gene Manipulation and Genomics** Principles of 7<sup>th</sup> Edition. Blackwell pub., NY

**Semester: VI**  
**Paper Code: 17U6BCE02**  
**Credit : 05**

**Elective: III**  
**Total Number of Hours : 60**  
**4Hours/ Week**

### **CLINICAL BIOCHEMISTRY**

**Objective:**

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

**UNIT I**

**12 Hours**

**Disorders in carbohydrate metabolism:** Introduction, blood glucose regulation, hypo and hyperglycaemia, renal threshold value. GTT, Diabetes mellitus : Types, Clinical features, metabolic effects, complications, Glycogen storage diseases.

**UNIT II**

**12 Hours**

**Disorders in protein metabolism:** Introduction, etiology and clinical features of phenylketonuria, alkaptonuria, cystinuria, albinism and tyrosinemia, clinical significance of non – protein nitrogen – urea, uric acid and creatinine. Metabolism of bilirubin, types of jaundice and its clinical features.

**UNIT III**

**12 Hours**

**Disorders in lipid and nucleic acid metabolism:** Introduction, Hypertriacyl glyceridemia, atherosclerosis – aetiology, clinical features and complication. Lipid storage diseases, fatty liver. Disorders of nucleic acid metabolism: Gout, types, aetiology and clinical features.

**UNIT IV**

**12 Hours**

**Organ function tests:** Detoxification and excretory function. Renal function test: Urea clearance and its interpretation. Gastric function test : Collection of gastric contents, examination of gastric residuum, FTM, stimulation test, tubeless gastric analysis.

**UNIT V**

**12 Hours**

**Clinically Important enzymes:** Mechanism responsible for abnormal level in serum. Enzyme level on the onset of myocardial infarction and hepatobiliary diseases. Clinical significance of SGOT, SGPT, ALP and ACP.



**TEXT BOOKS**

1. N.W.Teitz, (1994), **Textbook of Clinical Chemistry and Molecular Diagnostics** Fifth Edition W.B. Saunders company
2. Harold Varley (1988). **Practical Clinical Biochemistry**, Volume I and II 4<sup>th</sup> Edition, CBS Publishers New Delhi
3. Foye, O.W., Lemke,J.L. and William D.A. (1995). **Medicinal Chemistry**, B.I.Waverly Pvt. Ltd., New Delhi.

**REFERENCE BOOKS**

1. Philip. D. Mayne (1994). **Clinical Biochemistry in Diagnosis and Treatment** 6<sup>th</sup> Edition ELBS Publication
2. William J.Marashall and Stephen K bangert, (1995). **Clinical Biochemistry** – Metabolic and clinical aspects, Pearson Professional Ltd
3. A.C. Guyton & J.E.Hall, (2006). **Text Book of Medical Physiology** 11<sup>th</sup> Edition Harcourt Asia.
4. Thomas M.Devlin,(2010). **Text book of biochemistry with clinical correlations** 7<sup>th</sup> Edition John Wiley & Sons
5. Praful B. Godkar, Darshan P. Godkar(2014) **Textbook of Medical Laboratory Technology Clinical Laboratory Science and Molecular Diagnosis** 3<sup>rd</sup> Edition, Bhalani Publishing House

**Semester: VI**  
**Paper Code: 17U6BCCP07**  
**Credit : 05**

**Core practical:VII**  
**Total Number of Hours :45**  
**6 Hours/ Week**

### **CORE - BIOCHEMISTRY PRACTICALS – IV**

#### **Urine Analysis**

1. Qualitative analysis of normal and abnormal constituents in Urine
2. Estimation of creatinine in urine.
3. Estimation of urea in urine by DAM method
4. Estimation of uric acid in urine by caraway's method.
5. Estimation of chloride in urine by Vanslyke ' method.

#### **B. Blood Analysis**

1. Estimation of blood glucose by Asatoor and King method.
2. Estimation of blood urea by DAM method.
3. Estimation of creatine and creatinine in serum.
4. Estimation of Total proteins in serum by biuret method.
5. Estimation of cholesterol in serum by Zak's method.

#### **D. HAEMATOLOGY**

1. Estimation of Hemoglobin
2. Enumeration of RBC/WBC
3. Differential count
4. Determination of blood grouping
5. Bleeding time, clotting time
6. ESR

**REFERENCES**

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

**Semester: VI**  
**Paper Code: 17U6BCCP08**  
**Credit : 05**

**Core practical:VIII**  
**Total Number of Hours :45**  
**6 Hours/ Week**

**CORE - BIOCHEMISTRY PRACTICALS – VIII**  
**LAB IN MOLECULAR BIOLOGY, PLANT AND ANIMAL BIOTECHNOLOGY**

1. Isolation of genomic DNA from bacterial cells
2. Plasmid DNA isolation from *E. coli* by alkaline lysis method
3. Isolation of genomic DNA from animal tissue
4. Isolation of genomic DNA from plant tissue
5. Determination of nucleic acid concentration and analysis of purity of DNA and T<sub>m</sub> value
6. Determination of molecular weight of the isolated DNA
7. Preparation of M.S media
8. Callus induction
9. Micro propagation of plant tissue
10. Protoplast isolation
11. Preparation of chicken embryo fibroblast culture (monolayer)
12. Routes of egg inoculation

**REFERENCE**

1. Chellam Rajamanickam. Experimental protocols in Basic Molecular Biology. Osho Scientific Publications
2. S. K. Gakhar, Monika Miglani, Ashwani Kumar. (2013). Molecular Biology- A laboratory Manual. IK International Publishing House

**REFERENCES**

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

**B.Sc., BIOCHEMISTRY**  
**QUESTION PAPER PATTERN**

**MAXIMUM MARKS – 75 marks**

**DURATION – 3 hours**

**PART – A (20 marks)**

- a. Answer all the questions MCQs

**PART – B (5 X 5 = 25 marks)**

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

**PART – C (3 X 10 = 30 marks)**

1. Any three out of five (open choice)
2. From each unit one question

**17U5BCC05**

(For the candidates admitted from 2014 Onwards)  
**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN**  
**(AUTONOMOUS)**  
**HUMANS PHYSIOLOGY & NEUROCHEMISTRY**  
**III B.Sc., (BIOCHEMISTRY)-V Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. What are the secretion of digestive tract.
2. Write the role of Proteins
3. What is Blood coagulation
4. What are the types of Muscles
5. What are the gases exchange between lungs & tissues
6. What is E.C.G
7. Outline the structure of female reproductive organ
8. What is Parturition
9. What is synaptic transmission
10. What are the characteristics of parasympathetic function

**Answer all questions**

**PART B**

**(5X5=25)**

- 11.(a) Explain the absorption & assimilation of carbohydrates (or)  
(b) Write about the types of vitamins & minerals
- 12.(a) Write a note on Transport & exchange of gases between lungs & tissues. (or)  
(b) Write about Composition of Blood
- 13.(a) Write about the Physiology of cardiac muscles (or)  
(b) Write note on Blood pressure.
- 14.(a) Write the mechanism of urine formation (or)  
(b) Explain spermatogenesis
- 15.(a) Write about Neurons (or)  
(b) Characteristics of sympathetic function

**Answer any three questions**

**PART C**

**(3X10=30)**

16. Explain in detail about digestion, absorption, assimilation of carbohydrates & proteins
17. Write in detail about Composition, function & mechanism of blood coagulation
18. Explain the types, function and physiology of muscle contraction
19. Explain menstrual cycle & physiology of pregnancy & lactation
20. Classification of nervous system

17U5BCC06

(For the candidates admitted from 2014 Onwards)

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN  
(AUTONOMOUS)  
BIOCHEMISTRY IN DIAGNOSIS**

**III B.Sc., (BIOCHEMISTRY)-V Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Write the safety measures in laboratory.
2. Define cross matching.
3. Principle of colorimeter.
4. Define quality control.
5. Normal range of CSF and body fluids.
6. List out the thyroid hormones.
7. Normal range of sugar and uric acid.
8. Write the interfering substance in stool examination.
9. Define anticoagulation.
10. Define clotting time.

**Answer all questions**

**PART B**

**(5X5=25)**

11. a) Explain the precaution and first aid equipments.  
b) Explain the blood grouping and Rh typing.
12. a) Discuss about electron microscope and its uses.  
b) Write about general approach to quality control.
13. a) Explain analysis of semen.  
b) Give the interpretation of pregnancy test
14. a) What are the composition of urine and how it is preserved?  
b) Explain the test for occult blood and faecal fat.
15. a) Explain clotting time and bleeding time and anticoagulants.  
b) Explain the procedure of PCV

**Answer any three questions**

**PART C**

**(3X10=30)**

16. Explain in detail blood transfusion and its complication.
17. Write in detail about the working usage and care of centrifuge, analytical Balance & calorimeter.
18. Explain the functions of thyroid hormone and thyroid function test.
19. Explain the microscopic examination of urine
20. Explain the procedure of RBC & WBC count





(For the candidates admitted from 2014 Onwards)  
**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN**  
**(AUTONOMOUS)**  
**DRUG BIOCHEMISTRY**  
**III B.Sc., (BIOCHEMISTRY)-V Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Define Drug.
2. Define Drug distribution.
3. What is cytochrome P450.
4. Write about drug metabolising enzyme.
5. Define chemotherapy.
6. What is the action of antibiotic.
7. Define Antiseptics
8. Define Disinfectants.
9. Write about Allergy.
10. Define drug intolerance.

**SECTION B (5 X 5 = 25 Marks)**

11. a) Explain about absorption of drug. (or)  
b) Write about mode of administration of drug.
12. a) Discuss about phase I reactions of drug metabolism. (or)  
b) Write about phase II reactions of drug metabolism.
13. a) Explain about biochemical action of chloramphenicol. (or)  
b) Write about the action of alkaloids .
14. a) Explain about the general anaesthetics. (or)  
b) Write a short note on phenols and related compounds.
15. a) Discuss about Drug addiction. (or)  
b) Explain about allergy and its control measures.

**SECTION C (3 X 10 = 30 Marks)**

- 16) Explain about drug distribution and its elimination.
- 17) Describe about chemical pathways of drug metabolism.
- 18) Explain about antiviral and antimalarial substances.
- 19) Explain about antiseptics and disinfectants.
- 20) Explain in detail about drug abuses and their biological effects.

(For the candidates admitted from 2014 Onwards)  
**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN**  
**(AUTONOMOUS)**  
**BIOINFORMATICS**

**III B.Sc., (BIOCHEMISTRY)-V Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

- 1 Define computer.
2. What is Internet
3. BLAST
4. NCBI
5. Define CLUSTAL
6. What is mean by multiple sequence
7. How the secondary structure of proteins predicted.
8. Molecular visualization.
9. Define Bioinformatics
- 10 Define Microassay

**Answer all questions**

**PART B**

**(5X5=25)**

11. (a) Write notes on web browsing (or)  
(b) Write notes on URL
12. (a) Explain proteins sequence database. (or)  
(b) Define EMBL, DDJB
13. (a) Explain UPG. (or) AMAS  
(b) Define local, global, and multiple sequence alignment
14. (a) Explain physical properties of alpha and beta structure of protein. (or)  
(b) Explain visualization tool
15. (a) Explain the role of Bioinformatics in drug discovery. (or)  
(b) Write about new protein foods.

**Answer any three questions**

**PART C**

**(3X10=30)**

16. Write in detail about computer, internet-basic, connection.
17. Explain nucleic acid sequencing data base
18. Write a short notes on Multiple sequence alignments
19. Write about secondary structure and tertiary structure of protein
20. Explain about docking and prediction of drug quality

(For the candidates admitted from 2014 Onwards)

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN  
(AUTONOMOUS)  
IMMUNOLOGY**

**III B.Sc., (BIOCHEMISTRY)-VI Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. What is immunity?
2. Draw the structure of T and B cells?
3. What are haptens?
4. Write the applications of mono clonal antibodies.
5. Give short notes on immunofluorescence?
6. What is complement fixation?
7. Define hypersensitivity.
8. Write note on Myasthenia gravis.
9. Write about MHC.
10. What are recombinant vaccines?

**Answer all questions**

**PART B**

**(5X5=25)**

11. a) Explain the types of immunity?(or)  
b) Discuss about the cells involved in immune response.
12. a) Define: a) immunogenicity b) antigenic determinants c) adjuvants d) antibodies. (or)  
b) explain classes and subclasses immunoglobulins?
13. a) Discuss about complement fixation and agglutination (or)  
b) explain about immuno electrophoresis.
14. a) Write short notes on rheumatoid arthritis.(or)  
b) Explain the skin test.
15. a) Mechanism of HLA(or)  
b) Write notes on AIDS

**Answer any three questions**

**PART-C**

**(3X10=30)**

16. Explain the primary and secondary lymphoid organs.
17. Explain complement compound.
18. Explain the ELISA
19. Describe the types of Hypersensitivity.
20. Write in detail about benefits and adverse effect on vaccination.

(For the candidates admitted from 2014 Onwards)

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN  
(AUTONOMOUS)  
ENDOCRINOLOGY**

**III B.Sc., (BIOCHEMISTRY)-VI Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Define hormones.
2. What are pituitary hormones?
3. Give the structure of thyroid gland.
4. Disorder of parathyroid hormone.
5. Give the functions of glucagon.
6. Write short notes on gastrin.
7. What are the hormones of adrenal glands.
8. Define cortex hormone.
9. Give functions of androgens.
10. Give the chemical nature of estrogens

**Answer all questions**

**PART B**

**(5X5=25)**

11. a) Explain the hypothalamic hormones. (or)  
b) Classification of hormones.
12. a) Write about secretion and functions of thyroid hormones. (or)  
b) Structure and functions of para thyroid gland.
13. a) Explain the functions of pancreatic hormones. (or)  
b) Discuss the secretion and release of GI hormones.
14. a) Functions of adrenal medullary hormones. (or)  
b) Functions of adrenal cortex.
15. a) Functions of progesterones.. (or)  
b) Explain the chemical nature of testes and ovaries.

**Answer any three questions**

**PART-C**

**(3X10=30)**

16. Explain the role of secondary messengers in hormonal action.
17. Write in detail about parathyroid hormones.
18. Explain secretin and cholecystokinin.
19. Explain the hormones of adrenal glands.
20. Write about testes and ovaries.

17U6BCE02

(For the candidates admitted from 2014 Onwards)

**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN  
(AUTONOMOUS)  
GENETIC ENGINEERING  
III B.Sc., (BIOCHEMISTRY)-VI Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Define gene cloning
2. Define restriction endonuclease.
3. Define the Plasmids
4. Define cosmids
5. Define plasmid DNA
6. What is mean by probes?
7. Reporter genes
8. What are fusion proteins?
9. Gene therapy
10. Define fermentation

**Answer all questions**

**PART B**

**(5X5=25)**

11. a) What are the enzymes used in genetic engineering (or)  
b) Basic steps of gene
12. a) Write about phages (or)  
b) Write short notes on yeast and shuttle vectors
13. a) Write the purification of cellular and plasmid (or)  
b) Outline of sanger's methods
14. a) How proteins analysed by blotting techniques (or)  
b) Explain recombinant insulin
15. a) commercial applications of transgenic (or)  
b) Write about fermenter

**Answer any three questions**

**PART-C**

**(3X10=30)**

16. Write about restriction endonucleases-types, features, ligation
17. Write about blotting techniques
18. Method of DNA sequencing
19. Amplification of DNA by PCR techniques
20. write about bioprocess technology.

17U6BCE03

(For the candidates admitted from 2014 Onwards)

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

**CLINICAL BIOCHEMISTRY**

**III B.Sc., (BIOCHEMISTRY)-VI Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Define accuracy.
2. Define sensitivity.
3. What are the types of glycosuria?
4. Define atherosclerosis.
5. What is meant by Fanconi's syndrome?
6. Define galactosemia.
7. Define jaundice.
8. Write the normal range of urea, creatinine, inulin, plasma protein.
9. Define isoenzymes.
10. Define functional plasma enzymes.

**Answer all questions**

**PART B**

**(5X5=25)**

11. a) Write about fixation of normal range (Or)  
b) Discuss about reproducibility quality control.
12. a) Explain GTT (Or)  
b) Write about mode of action-cholesterol.
13. a) Discuss about alkaptonuria (Or)  
b) Explain tyrosinemia and haemophilia.
14. a) Write about metabolism of bilirubin (Or)  
b) Discuss about tubeless gastric analysis.
15. a) Write about liver damage (or)  
b) Explain about myocardial infarction.

**Answer any three questions**

**PART C**

**(3X10=30)**

16. Explain concept of accuracy, precision, sensitivity, reproducibility and quality control.
17. Explain about diabetes mellitus.
18. Discuss about phenyl ketonuria, cystinuria, alkaptonuria.
19. Write about liver function test.
20. Explain about isoenzymes with examples.

(For the candidates admitted from 2014 Onwards)  
**VIVEKANANDHA COLLEGE OF ARTS & SCIENCE FOR WOMEN**  
(AUTONOMOUS)  
**NUTRITIONAL BIOCHEMISTRY**  
**III B.Sc., (BIOCHEMISTRY)-VI Semester**

**Time: 3 Hrs**

**Maximum marks:75**

**Answer all questions**

**PART A**

**(5X2=10)**

1. Define BMR.
2. Define diet and nutrition.
3. What are dietary requirements for pregnant women.
4. Define complete protein.
5. Define malnutrition.
6. Biological value of protein
7. Mention the dietary macronutrient
8. Disorder related to deficiency of trace elements.
9. List out the trace elements.
10. Write the role of diet and nutrient in prevention of disease

**Answer all questions**

**PART B**

**(5X5=25)**

11. (a) Explain Measurement of energy expenditure. (or)  
(b) Discuss about Dairy energy requirement and its important.
12. (a) Write about recommended dietary allowance for infant and children. (or)  
(b) Discuss about role of dietary fibre
13. (a). Explain about protein content of diets. (or)  
(b). Explain about management of marasmus
14. (a) Write about the nutritional significance of dietary macro minerals . (or)  
(b). Explain about disorders of minerals.
15. (a) Discuss about effect of drug on food (or)  
(b) Write about drug nutrient interaction.

**Answer any three questions**

**PART C**

**(3X10=30)**

16. Write about the measurement of BMR and factors affecting it.
17. Write about recommended dietary allowance for pregnancy and lactation.
18. Explain about marasmus and kwashiorkor
19. Disorders of the nutritional significance of dietary minerals
20. Explain role of diet and nutrition in the prevention of disease.