।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574

Website: www.srtmun.ac.in

E-mail: bos.srtmun@gmail.com

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics	2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology	4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science	6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture	8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry	10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry	12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry	14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year	16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology	18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)	20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering	22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics	24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science	26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics	28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology	30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics	32. B.Sc.-II Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२०–२१/**३३३**

दिनांक : १५.०७.२०२०.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

SWAMI RAMAMAND TEERTH MARATHWADA UNIVERSITY, NANDED-431606, MS. INDIA

Under Faculty of Science

B.Sc Syllabus structure

CBCS (Choice Based Credit System)

Semester Pattern effective from June-2020

Subject: Biochemistry (Honors)

B.Sc Biochemistry Second Year (Semester-III)

Course No	Course Title	Periods/ week	Total Period	Internal Evaluation	External Evaluation	Credits
BC-III-301	English	03	45	10	40	02
BC-III-302	Clinical biochemistry	03	45	10	40	02
BC-III-303	Genetics	03	45	10	40	02
BC-III-304	Cell Biology	03	45	10	40	02
BC-III-305	Enzymology-1	03	45	10	40	02
BC-III-306	Advance microbiology	03	45	10	40	02
SEC-I	Biochemical Technique	04	60	10	40	02
LCBC-III-1	Cell Biology& Microbiology	04	60	10	40	02
LCBC-III-2	Enzymology & Genetics	04	60	10	40	02
						18

SWAMI RAMAMAND TEERTH MARATHWADA UNIVERSITY, NANDED-431606, MS. INDIA

Under Faculty of Science

B.Sc Syllabus structure

CBCS (Choice Based Credit System)

Semester Pattern effective from June-2020

Subject: Biochemistry (Honors)

B.Sc Biochemistry Second Year (Semester-IV)

Course No	Course Title	Periods/ week	Total Period	Internal Evaluation	External Evaluation	Credits
BC-IV-401	English	03	45	10	40	02
BC-IV-402	Advance Chemistry	03	45	10	40	02
BC-IV-403	Enzymology-II	03	45	10	40	02
BC-IV-404	Molecular biology	03	45	10	40	02
BC-IV-405	Membrane biochemistry	03	45	10	40	02
BC-IV-406	Industrial biotechnology	03	45	10	40	02
BC-IV-407	Plant biochemistry	03	45	10	40	02
SEC-II	Biochemical Technique	04	60	10	40	02
LCBC-IV-1	Enzyme & Advance biotechnology	04	60	10	40	02
LCBC-IV-2	Mol.Bio& Membrane biochemistry	04	60	10	40	02
LCBC-IV-3	Clinical & plant biochemistry	04	60	10	40	02
						22
		3rd + 4thSemester Total Credits (18+18) =				**38**

Note:

1. Laboratory Course includes Skill enhanced Practical as mentioned therein.
2. The Practical Examination Will be conducted at the end of Semester.
3. **Practical in the Laboratory course papers will be conducted throughout year i.e. during third and fourth semester**.

4. Internal evaluation includes conduction of One internal test (Theory/ Objective or Both in one paper)
5. Internal evaluation for laboratory course should be for skill enhancement based practical.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERCITY, NANDED -431606, MS. INDIA

Syllabus B.Sc. Biochemistry
Under Faculty of Science
CBSC (Choice Based Credit System)
Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year Semester Practicals

Practical Paper (For III and IV semester	**Paper Title**	**Period/Week**	**Total Period**	**Internal evaluation**
LCBC-III-1	Cell Biology& Microbiology	**03**	**45**	**10**
LCBC-III-2	Enzymology & Genetics	**03**	**45**	**10**
LCBC-IV-1	Enzymology & Industrial biotechnology	**03**	**45**	**10**
LCBC-IV-2	Mol.Bio& Membrane biochemistry	**03**	**45**	**10**
LCBC-IV-3	Clinical & plant biochemistry	**03**	**45**	**10**
		3rd + 4thSemester Total Credits (18+18) =36		

Note: 01 credit= 25 Marks

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED-431606, MS, INDIA

Distribution of credits for B.Sc Biochemistry
Under Faculty of Science
B.Sc Syllabus Structure
CBCS (Choice Based Credit System)
Semester Pattern effective from June 2018
Subject: Biochemistry (Honors)
B.Sc Biochemistry Third Year (Semester-III)
Title of the Paper: Clinical Biochemistry (CBCS-III-302)

Period: 45 **Marks-50**

Objective(s):
To acquire basic knowledge about inborn error of metabolism, marker enzyme, and management of disease.

Course Outcome(s): The student will be able to

1. Know disease is at molecular level.
2. Know chemical components of the body.
3. Understand, detection of biomolecule in clinical specimen like blood, urine, CSF..
4. Detect abnormal constituent for the diagnosis of disease.
5. Know the Biopsy

Unit-1 Inborn Errors of Metabolism **10 hrs.**

Carbohydrate : Lactose intolerance, glycogen storage disease and galactosurea. Protein : Phenylketonuria, Alkaptonuria, Albinism and Maple syrup urine disease. Lipids : Gaucher's disease , Nieman Pick's disease and Tay sach's disease . Nucleic acid : Leach – Nyhan syndrome, Gount.

Unit – II Diagnostic Biochemistry – I **10 hrs.**

Marker enzymes: Significance SGOT, SGPT, LDH, Alkaline Phosphates.

Etiology, symptoms and control of:

1. AIDS 2. Hepatitis 3. Arthrosclerosis

Unit – III Diagnostic Biochemistry – II **10 hrs.**

Diabetes: Classification, structure and biosynthesis of insulin mechanism of action of insulin. Glycosuria and Hypoglycemia: introduction and types. Management of Diabetes. Glucose tolerance test.

Unit – IV Clinical Pathology **15 hrs.**

Antigen, structure and function of different immunologobulins. Primary and secondary immune response. Humoral and cell mediated immunity. Principle and application of: RIA, ELISA. Biopsy techniques: introduction, purposes, principle. Concepts of steam cells, its application.

REFERENCE BOOK

- Satanarayana (2006), textbook of Biochemistry, U.Staynarayana and U.Chakrapani edition third.
- Clinical Pathology – Manual for Undergraduates, Sabitri Sanyal, B.I. Churchill Living stone, Pvt.eddition first.
- Textbook of Human Biochemistry by G.P.Talwar
- Harper's book of Biochemistry edited by Murray and Granner, Appleton and Lange, latest edition.
- Clinical pathology – Sood.R, Jaypee Pub. New Delhi.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERCITY, NANDED -431606, MS. INDIA

Syllabus B.Sc. Biochemistry
Under Faculty of Science
CBSC (Choice Based Credit System)
Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Genetics (BC-III-303)

Hours: 45

Objective(s): To understand basic knowledge about Genetics such as mendals law, chromosomal theory and mutation.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of genetics
2. Understand the chromosomal theory of inheritance
3. Know the different type of mutation
4. Explaining mechanism transformation, transduction
5. Learn the gene frequency.

Unit I 09

Introduction and History of Genetics, Laws of Mendel (I law, II law, III law), Test cross, Back cross, Chromosomal theory of Inheritance, Dominance, Lethal genes.

Unit II 09

Gene Interaction, chi-square test, Genotype and phenotype, crossing over, Factors effecting recombination frequency, multiple alleys, ABO antigen, Pseudoallels.

Unit III 09

Recombination in bacteria (Transformation, Transduction, Conjugation), Sex determination in plants, sex determination in animals, Dosage compensation, Sex linkage, Epitasis.

Unit IV 09

Mutation: Introduction, characteristics and classification of mutation (Spontaneous & induced mutation), Detection of mutation, Base substitution, addition and deletion, Application of mutation.

Unit V 09

Population genetics: Gene frequency, Genotype frequency,
Hardy – Weinberg laws and equilibrium,
Chromosomal aberrations: (Structural, numerical aberrations).

Reference Books:

1. Basic Genetic - Hartle , Freifelds, Seryder.
2. Genetics - Stricberger M.W., Marmillan Publication Inc. (1976)
3. Expending horizons (Introduction to biotechnology by B.D.Singh (Kalyani
4. Principles of gene manipulation, S.B.Primrose (6^{th} Editioin).
5. Principle of genetics - Gardner, et-al.
6. Genetics – P.K.Gupts, Rastogi Publication Meerut – 2001.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERCITY, NANDED -431606, MS. INDIA

Syllabus B.Sc. Biochemistry
Under Faculty of Science
CBSC (Choice Based Credit System)
Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Cell Biology (BC-III-304)

Hours: 45

Objective(s): To understand basic knowledge about cell biology such as cell structure. Cell cycle, cell theory.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of cell size and shape
2. Understand the mechanism cell cycle
3. Know the different type of cell
4. Explaining protein localization
5. Learn the cancer cell.

Unit I 10

Diversity of cell size and shape, Structure of eukaryotic cells, prokaryotic. Cell theory, cellular organelles plasma membrane, cell wall, Their structural organization, lysosomes, mitochondria, peroxisome.

Unit II o5

Cell cycle – G & S phases, mitosis & meiosis, cell motility – cilia, flagella of Eukaryotes & prokaryotes.

Unit III 10

Biosynthesis of proteins in eukaryotic cell, co & past translational modification, intracellular protein trafficking.

Unit IV

10

Protein localization: Synthesis of secretary and cytosolic proteins, import of proteins to Nucleus, Chloroplast, peroxisome, receptor mediated endocytosis.

Unit V **10**

Biology of Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, metastasis apoptosis.

References Books:

1. Powar C.B. (2012) Cell Biology, 3rd edition, Himalaya Publishing House, Mumbai

2. Chatterjee C.C. (2004) Human physiology Vol. I, 11th edition, Medical allied Agency, Kolkata, India.

3. Nelson,D.L. and Cox, M.M. (2007) Lehninger's Principles of Biochemistry 4th edition, W.H. Freeman and Company, New York, USA.

4. Conn, E. E., Stumpf, P. K., Bruening G., Doi R. H. (2007) Outlines of Biochemistry, Wiley India (P) Ltd., New Delhi.

5. Stryer, L., Tymcozko J. L., Berg J. M. (2012) Biochemistry, W. H. Freeman and Company, New York, USA.

6. Rastogi S.C. (2001) Biochemistry, 7th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

7. Satyanarayana, U. and Chakrapani U. (2010) Biochemistry, Books and Allied Pvt. Ltd., Kolkata, India.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERCITY, NANDED -431606, MS. INDIA

Syllabus B.Sc. Biochemistry
Under Faculty of Science
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Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Enzymology-1 (BC-III-305)

Hours: 45

Objective(s): To understand basic knowledge about enzyme such as coenzyme, classification and mechanism of enzyme.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of coenzyme and enzyme
2. Understand the mechanism of enzyme
3. Know the different type of enzyme
4. Explaining enzyme kinetic
5. Learn enzyme purification.

Unit-1

Basic concept in enzymology 12

Terms involved in enzymology, Nomenclature of enzymes, classification of enzymes, properties. Coenzyme- Structure and function , TPP, NAD, NADP, FAD, FMN. Enzyme specificity, Mechanism of enzyme action- Lock and key model, induced fit model.

Unit-2

Enzyme Kinetics 12

Importance of kinetics, Concept of steady state and rapid Equilibrium kinetics .Factor affecting enzyme activity, temperature, pH, Concentration, Substrate, Measurements of velocity and its importance. Derivation of Michalies –menton equation, Single and double reciprocal plots. Unit of enzyme activity, Enzyme turnover number.

Unit-3

Mechanism of enzyme action 12

Distribution and localization of enzymes in eukaryotic cell. Mode of enzyme catalysis- covalent, proximate or orientation effect, acid base etc. Chemistry of active center, chemical modification studies by active site directed reagents physical methods for determination of active site conformation. Various theories of mechanism of enzyme action, Structure, function relation of Rib nuclease and chymotrypsin.

Unit-4 09

Method of purification of enzymes

Centrifugation, ammonium precipitation, solvent precipitation.

Reference Books:

1. Biochemistry – Zuby.
2. Biochemistry – Stryer.
3. Principle of Biochemistry- Lehninger.
4. Fundamental of enzymology- price and Stevens

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Syllabus B.Sc. Biochemistry
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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Advanced Microbiology (BC-III-306)

Hours: 45

Objective(s): To understand advances in microbiology and its application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of Microbial flora of water
2. Understand the mechanism spoilage of food
3. Know the different type technique to control microorganism
4. Explaining mechanism biological treatment
5. Learn the role of microorganism in food preservation..

Unit-1 13

Microbial flora of water: Biotic & Abiotic factors affecting number of organism in natural water. Bacteriological examination of water: Sample collection tests, detection of coli forms in water (Presumptive, conformed, completed tests), (SPC standard plate count), membrane filter count, MPN, detection of fecal streptococci & clostridium. Determining sanitary quality of water bacteriological evidence, significance of index organism (*E-coli*, streptococcus facalis). IMVIC test & elevated temperature.

Unit –II 09

Microbiology of Food : Microbial spoilage of food, chemical changes caused by micro-organisms, Principles of Food preservation, control of micro-organisms by use of low & high temperature, dehydration, aseptic handling, pasteurization, lyophilization, radiation pressure for control of micro-organisms.

Unit-III Waste Water Microbiology 13

Definition of sewage, chemical composition of sewage, Measurement of strength of sewage by BOD & COD sewage treatment, disposal, objective, importance of sewage disposal. Methods of sewage Treatment – Single dwelling unit, septic tank, evaporation tank, imhalf tank. Secondary Biological Treatment – Tricking filter, Activated sludge process, oxidation pond, activated sludge digestion. Chemical treatment : Chlorination . Disposal of treated sewage, sludge as fertilizers.

Unit IV Advanced Microbial Techniques 10

Microbial techniques used for isolation of bacteria, Antimicrobial activity by using disc diffusion techniques, Measurement of cell mass by turbid metric method , Widal test for diagnosis test for diagnosis of *S.typhi,* Bioremediation & phytoremidiation.

References_Books :

1. Community Nutrition - MC.Laren
2. General Microbiology - R.Y.Stainer
3. General Microbiology Vol.I &II - H.F.Daginawala & Pawar
4. Text book of Microbiology - M.B.Deshmukh, P.S.Wakte & others.

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Syllabus B.Sc. Biochemistry
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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Biochemical Technique (BC-III-SEC-I)

Hours: 45

Objective(s): To understand advances technique and its application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of chromatography
2. Understand the mechanism each technique
3. Know the different type separation technique
4. Explaining mechanism
5. Learn the extraction method..

1. **Thin Layer Chromatography**
2. **Gel Electrophoresis**
3. **Spectrophotometer**
4. **PCR**
5. **Southern blotting**
6. **Northern Blotting**
7. **Western blotting**
8. **Extraction of bio molecule by soxhalet apparatus.**
9. **ELISA**
10. **HPLC**

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Syllabus B.Sc. Biochemistry
Under Faculty of Science
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Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: - Cell Biology& Microbiology (BC-III-LCBC-I)

Hours: 45

Objective(s): To understand varies technique and its application in biochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of mitosis and meiosis
2. Determine total cell count and explain is significance
3. Analyse waste water BOD/COD
4. Explaining milk pasturation
5. Performing antimicrobial activity.

List of Experiments

1. To study Mitosis
2. To Study Meiosis
3. Direct viable cell counting.
4. To Study of Cell Motility.
5. To study Osmosis.
6. Determination of Growth curve of bacteria. (*E-coli* Pseudomonas).
7. Total Cell Count.
8. SPC Count.
9. Isolation of faecal coliform.
10. Study of IMVIC Test.
11. Milk Pasturation.
12. Determination of thermal death time/point of food Microorganism.
13. Determination of BOD.
14. Determination of COD
15. Estimation of of dissolved oxygen
16. Antimicrobial Susceptibility test

Reference Book

1. Plummer D. T. (2005) An Introduction to Practical Biochemistry, TATA McGraw-Hill.

2. Sadasivam S. and Manickam A. (2008) Biochemical Methods, 3rd edition, New Age International Publishers.

3. Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A Student Companion, I.K. International Pvt. Ltd., New Delhi.

4. Sawhney S.K. and Singh Randhir (2011) introductory practical Biochemistry, Narosa Publication House Pvt. Ltd.

5. Jayaraman J. (1981) Laboratory Manual in Biochemistry, New Age International Publishers

6. Aneja K.R. (2007) Experiments in Microbiology, Plant Pathology and Biotechnology, New Age International Publishers.

7. Kale V. and Bhusari K. (2010) Practical Microbiology: Principles and Techniques, Himalaya Publishing House.

8. Godkar P.B. and Godkar D.P. (2003) Textbook of Medical Laboratory Technology, Second Edition, Bhalani Publishing House.

9. Rajgopal G. and Toora B.D. (2005) Practical Biochemistry, 2nd edition, Ahuja Publishing House.

10. Maheshwari D.K. (2002) Practical Microbiology, S. Chand Publishing.

11. Rajan S. and Christy Selvi R. (2015) Experimental Procedures in Life Sciences, CBS Publishers and Distributors Pvt. Ltd.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERCITY, NANDED -431606, MS. INDIA

Syllabus B.Sc. Biochemistry
Under Faculty of Science
CBSC (Choice Based Credit System)
Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-III)

Title of the Paper: Enzymology & Genetics (BC-III-LCBC-2)

Hours: 45

Objective(s): To understand varies technique and its application in biochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of electrophoresis
2. Determine enzyme activity and explain is significance
3. Analyse pectinase
4. Explaining mendals law
5. Understanding restrictions digestion..

List of Experiment

1. Determination of enzyme activity of alpha amylase.
2. Isolation of alph-amylase from Saliva.
3. Isolation of Invertase.
4. Extraction of Beta amylase from Potato.
5. Extraction of urease from jack bean.
6. Extraction of urease from horse gram.
7. Extraction of pectinase from guva.
8. Determination of urease activity.
9. Determination of pectinase activity.
10. Problems based on Mendel's laws.
11. Extraction of DNA.
12. Demonstration of transformation.
13. Study of conjugation.
14. Separation of DNA by electrophoresis
15. Study of restriction digestion.

Reference Books

1. Plummer D. T. (2005) An Introduction to Practical Biochemistry, TATA McGraw-Hill.

2. Sadasivam S. and Manickam A. (2008) Biochemical Methods, 3rd edition, New Age International Publishers.

3. Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A Student Companion, I.K. International Pvt. Ltd., New Delhi.

4. Sawhney S.K. and Singh Randhir (2011) introductory practical Biochemistry, Narosa Publication House Pvt. Ltd.

5. Jayaraman J. (1981) Laboratory Manual in Biochemistry, New Age International Publishers

6. Aneja K.R. (2007) Experiments in Microbiology, Plant Pathology and Biotechnology, New Age International Publishers.

7. Kale V. and Bhusari K. (2010) Practical Microbiology: Principles and Techniques, Himalaya Publishing House.

8. Godkar P.B. and Godkar D.P. (2003) Textbook of Medical Laboratory Technology, Second Edition, Bhalani Publishing House.

9. Rajgopal G. and Toora B.D. (2005) Practical Biochemistry, 2nd edition, Ahuja Publishing House.

10. Maheshwari D.K. (2002) Practical Microbiology, S. Chand Publishing.

11. Rajan S. and Christy Selvi R. (2015) Experimental Procedures in Life Sciences, CBS Publishers and Distributors Pvt. Ltd.

SWAMI RAMAMAND TEERTH MARATHWADA UNIVERSITY, NANDED-431606, MS. INDIA

Under Faculty of Science

B.Sc Syllabus structure

CBCS (Choice Based Credit System)

Semester Pattern effective from June-2020

Subject: Biochemistry (Honors)

B.Sc Biochemistry Second Year (Semester-IV)

Course No	Course Title	Periods/ week	Total Period	Internal Evaluation	External Evaluation	Credits
BC-IV-401	English	03	45	10	40	02
BC-IV-402	Advance Chemistry	03	45	10	40	02
BC-IV-403	Enzymology-II	03	45	10	40	02
BC-IV-404	Molecular biology	03	45	10	40	02
BC-IV-405	Membrane biochemistry	03	45	10	40	02
BC-IV-406	Industrial biotechnology	03	45	10	40	02
BC-IV-407	Plant biochemistry	03	45	10	40	02
SEC-II	Biochemical Technique	04	60	10	40	02
LCBC-IV-1	Enzymology& Advance biotechnology	04	60	10	40	02
LCBC-IV-2	Mol.Bio& Membrane biochemistry	04	60	10	40	02
						20
		3rd + 4thSemester Total Credits (18+18) =				**38**

Note:

1. Laboratory Course includes Skill enhanced Practical as mentioned therein.
2. The Practical Examination Will be conducted at the end of year.
3. **Practical in the Laboratory course papers will be conducted throughout year i.e. during third and fourth semester**.
4. Internal evaluation includes conduction of One internal test (Theory/ Objective or Both in one paper)
5. Internal evaluation for laboratory course should be for skill enhancement based practical.

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Syllabus B.Sc. Biochemistry
Under Faculty of Science
CBSC (Choice Based Credit System)
Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: Advance Chemistry (BC-IV-402)

Hours: 45

Objective(s): To understand basic knowledge of heterocyclic compound, spectroscopy and electrochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of heterocyclic compound
2. Understand the mechanism spectroscopy
3. Know the different organic reaction
4. Explaining mechanism of electrochemistry.
5. Learn the conducto metric titration.

UNIT – I Heterocyclic Compounds 8

Introduction, importance, classification, five and six membered ring containing one hetero atom, structure, synthetic method, Physical and chemical of followings.

- Furan
- Pyrrol
- Thio-Phene
- Pyran
- Quinoline
- Indol

UNIT– II Organic Spectroscopy 8

UV and visible spectroscopy – absorption laws, types of electronic transitions, auxochrome, chromophore, conjugated dienes, Woodward – Fieser based numerical for calculating Amax.

IR spectroscopy – molecular vibrations, frequency, types of vibrations. IR region, applications of IR spectra to find out the structures of alkenes, aromatic Hydrocarbons, alcohols, phenols, Ethers, carbonyl! Compound, ketones, carboxylic acids.

UNIT – III Organic Reactions and Applications 08

Study of following reactions, mechanisms with their applications Aldol, Perkin, Beyer-villiger, Diels-Alder, Knoevenagel, Friedel-craft, Opponager oxidation, Reformat sky reaction.

UNIT– IV Electrochemistry 10

Introduction, conductance, specific, equipment conductance, variation, molar concentration. Arrhenius theory, transport number and determination, conduct metric titrations, kohtrauch's law and an application.

UNIT-V Organic Stereochemistry 12

Isomerism, Types of isomerism, representation of organic molecules, optical isomerism. Plane polarized light, optical activity. Working of polarimeter angle of rotation, specific rotation d-l. Cause of optical activity symmetry, elements and chirality, enantiores and their properties. Chiral and achiral molecule with 1 and 2 stereogenic centers. Diastereoisomers. Threo and erythreo diastereoismomers mesoforms. Relative and absolute configuration d-l rotation, Sequence Rule R & S nomenclature .Geometrical isomerism cis and Trans isomerism and E and Z systems of nomenclature, conformational analysis of ethane, n-butane and cyclohexane.

Reference book

1. Test book of Inorganic chemistry : Gurudeep Raj & Chatwal
2. Advanced Organic Chemistry : Bhal & Bhal
3 Advanced Organic Chemistry : P.L.Soni
4. Organic Chemistry : Marrison & Boyd.
5. Stereochemistry : P.S.Kalsi
6. Fundamentals of Chemistry : Farooqui, Kuberkar & Wangikar
7. A Text book of chemistry : Kuberkar, Nanded.

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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: Enzymology-II (BC-IV-403)

Hours: 45

Objective(s): To understand basic knowledge of enzyme inhibition, type, biological control, regulation and industrial application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of enzyme inhibition.
2. Understand the enzyme inhibitor.
3. Know the regulation and biological control.
4. Explaining mechanism immobilised enzyme
5. Learn the application of enzyme inhibitor.

Unit-1

Enzyme Inhibition 12

Enzyme inhibitor types, kinetics of enzyme inhibition, role of coenzyme in metabolism. Role of metals in enzyme kinetics. Activator kinetics, Bi substrate kinetics, Kinetic for reversible enzyme catalyzed reaction, Haldane relation ship'

Unit-2

Biological control 12

Multienzyme complexes and their significance in metabolic control. Membrane bound enzymes in metabolic control. Compartmentalization of enzymes and substrate, the shuttle systems.

Unit-3

Enzyme regulation 12

Allosterism, nature of allosteric enzymes and sigmoid kinetics, mode of action, allosteric , regulation. Product inhibition, feed back control, enzyme induction and repression. Mode of hormonal action on enzymes. Concept of receptors, agonist and antagonists.

Unit-4 **o9**

Enzyme Technology

Industrial uses of enzymes- Food and pharmaceutical industries. Clinical enzymology- serum enzymes in health and diseases.

Immobilised enzyme technology-

designer enzymes-Abzymes .Biosensor- Ribozymes

Reference Books:

1. Biochemistry – Zuby.
2. Biochemistry – Stryer.
3. Principle of Biochemistry- Lehninger.
4. Fundamental of enzymology- price and Stevens

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Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: Molecular Biology (BC-IV-404)

Hours: 45

Objective(s): To understand basic knowledge of replication, translation, repair mechanism and application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of DNA
2. Understand the mechanism DNA replication
3. Know the different steps in translation
4. Explaining mechanism post translation
5. Learn the DNA repair mehanism.

Unit - I 09

Evidences for DNA as genetic material, Experimental proof, Identification of DNA as a genetic material . Defination of gene, organization of genes & satellite DNA cot value.

Unit - II 09

DNA replication in prokaryotes, mode of replication (conservative semiconservative & dispersive). Mechanism of DNA replication: Locus, RNA primer, okazki fragment. Enzymes & factors involved in replication.

Unit - III 09

RNA polymerase, sigma factor Initiation, Elongation & termination of transcription Post transcriptional modification (Poly A tail, S' cap)

Unit - IV 09

Steps involved in translation – Initiation, elongation & termination.

Post translation modification.

Unit - V **09**

Repair of DNA, types of damages, Excision repair, and recombination. SOS repair & photo reactivation. Regulation of gene action – concept of operon, regulation of genes (lac operon)

References Books:

1. Powar C.B. (2012) Cell Biology, 3rd edition, Himalaya Publishing House, Mumbai

2. Chatterjee C.C. (2004) Human physiology Vol. I, 11th edition, Medical allied Agency, Kolkata, India.

3. Nelson,D.L. and Cox, M.M. (2007) Lehninger's Principles of Biochemistry 4th edition, W.H. Freeman and Company, New York, USA.

4. Conn, E. E., Stumpf, P. K., Bruening G., Doi R. H. (2007) Outlines of Biochemistry, Wiley India (P) Ltd., New Delhi.

5. Stryer, L., Tymcozko J. L., Berg J. M. (2012) Biochemistry, W. H. Freeman and Company, New York, USA.

6. Rastogi S.C. (2001) Biochemistry, 7th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

7. Satyanarayana, U. and Chakrapani U. (2010) Biochemistry, Books and Allied Pvt. Ltd., Kolkata, India.

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Subject: Biochemistry (Honors)
B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: Membrane Biochemistry (BC-IV-405)

Hours: 45

Objective(s): To understand basic knowledge of bio membrane,, transport mechanism and application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of biomembrane
2. Understand the mechanism tansport.
3. Know the structure of nerve
4. Explaining mechanism antibiotic
5. Learn the defence mehanism.

Unit-1

Biomembrane 10

Defination, Physicochemical properties of biological membrane, Structure and Composition, Singer and Nicolsons model.Bacterial cell envelope, asymmetry flip flop, protein lipid interaction Biological and physical models, energetics and transduction phenomena, Biochemical Chemiosmotic hypothesis of mitchell

Unit-II

Membrane Transport 15

Laws of diffusion across membrane, Simple diffusion, facilitated diffusion and active transport, transport role of proteins in the process, exocytosis, receptor mediated endocytosis, osmoregulation. Na, H dependent processes and phosphotransferase synthesis. Specialised

mechanism for transport of macromolecule, gap junction, Nuclear pores, toxin Control of trasport process, binding proteins, harmone effects and the role of lipids Role of Na,K, ATPase and passive permeablity of the plasm membrane to Na. K and Cl, Voltage and ligand gated ion channels, ATP-ADP exchanger**.**

Unit-III

Nerve Transmission 10

Structure of neuron, axon, dendrectes, Synapse neuromuscular junction . Neuro transmitters mechanisms of nerve conduction, adrenergic neuron and muscarinic neurons, GABA, NMDA. Structure and function of acetyl choline recptor

Unit-IV

Molecular Mechanism 10

Ion translocating antibiotics, valimomycin, gramicidin, ouabain, group translocation, ionophores, electrical gradient , energy coupling mechanism, assembly of virus membrane receptor

Unit-V

Penetrating the defenses 10

How antimicrobial agents reach their targets, cellular permeability barrier to drug penetration, some examples of modes of penetration of antimicrobial agents, the exploitation of transport systems in the design of new antimicrobial agents.

Reference Books:

1. Membrane and their cellular function By IB Filnean, R.Coleman and RH Michell, 1994, Blackwell publication.
2. Biochemistry – Zuby.
3. Biochemistry – Stryer.
4. Principle of Biochemistry- Lehninger.

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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: Industrial Biotechnology (BC-IV-406)

Hours: 45

Objective(s): To understand basic knowledge of fermentation, biofuel, bio control agent and application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of fermentation
2. Understand the mechanism fermentation
3. Know the different bio control agent
4. Explaining mechanism biodiesel
5. Learn the patent filing.

Unit - I Biotechnology & Health Care 12

Vaccines: An ideal vaccine, conventional vaccines, DNA vaccine, Recombinant vaccines. Disease diagnosis: DNA/RNA probes, Monoclonal antibodies. Disease Treatment: Product from non-recombinant organisms, Products from recombinant Gene therapy.

Unit - II Fuel Biotechnology 09

Biofuel : Introduction, useful features, advantages Biodiesel: Lipids as a source of biodiesel from hydrocarbons. Biogas: The substrate, the digester, The microorganism, process, factors, effecting biogas yields, Advantages &disadvantages.

Unit - III Biocontrol Agents 09

Bioinsecticides, Bioherbicide, Bioweedicide, Disease control, Advantages limitation, Golden rice, Bio plastic.

Unit – IV Fermentation technology 08

Type of bioreactor, Measurement and control environment. Fermentation kinetic, fermentation process, production of citric acid cyle,antibiotic, vitamin and ethanol.

Unit – V Intellectual Property Rights 08

Introduction, Protection of intellectual property rights, Trade secrets, patent copyrights, and Good laboratory practices (GLP) plant variety protection.

Reference Books :

Genes III - Lewin B, Oxford University Press, New York (2000)
Satyanarayanna (2006), Textbook of Biotechnology, U.Satynarayana.
Biotechnology – Expanding Horizons, B.D. Sign.
Basic Biotechnology – P.K.Gupta, Rastogi Publication, Meerut (2001).

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Distribution of credits for B.Sc Biochemistry
Under Faculty of Science
B.Sc Syllabus Structure
CBCS (Choice Based Credit System)
Semester Pattern effective from June 2018
Subject: Biochemistry (Honors)
B.Sc Biochemistry Second Year (Semester-IV)
Title of the Paper: Plant Biochemistry (CBCS-IV-407)

Period: 45 **Marks- 50**

Objective(s):
To acquire basic knowledge about plant cell, photosynthesis, plant hormone and biochemical changes of seed germination.

Unit-1

Plant cell and Photosynthesis **12**

Structure of plant cell (i) structure of plant cell membrane and cell wall. Photosynthesis – Structure & function of chloroplast of system, photosynthetic pigment and their functions, photosystem I & II.Photosynthetic electron transport and phosphorylation. Calvin cycle (C3 plant) Hatch slack pathway (C4 plants)

Unit-II Plant tissue culture and Hormones **11**

Plant tissue culture, plant cell organs & embryo culture, another culture somaclonal variation properties isolation fusion and culture of protoplasts, application of plant tissue culture transgenic plant.

Unit-III Plant Hormones **10**

Plant hormones, Biosynthesis, structure and biochemical mode of action of auxins, gibberellins, ctokinins, absciisic acid and ethylene, other plant growth regualtior.

Unit-IV Biochemistry of plant growth **12**

Biochemistry of seed development, dormancy, Biochemical changes during germination of seeds, Biochemistry of fruit development and rip ending. Structure and function of phytochrome, hormonal regulation of flowering, phtoperiodism and vernilization**.**

Reference:

1. Biochemistry – Zubey.
2. Biochemistry – Stryer.
3. Principal of microbiology- prescott
4. Fundamental of biochemistry- Voet and Voet
5. Molecular Biology of the cell- Bruce Albe

Course Outcome(s): The student will be able to

1. Understand the basic concept of photosynthesis.
2. Know chemical components of the plant cell.
3. Understand classification of plant hormone.
4. Able to understand plant metabolic pathway.
5. Know the phytochrome

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Under Faculty of Science
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Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: - Biochemical Technique (BC-III-SEC-II)

Hours: 45

Objective(s): To understand advances technique and its application.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of chromatography
2. Understand the mechanism each technique
3. Know the different type separation technique
4. Explaining mechanism
5. Learn the microbial culture method.

1. **Detection of blood group in human**
2. **Paper chromatography**
3. **Streaking, spreading, pouring technique for microbial culture**
4. **PCR**
5. **Antigen-antibody interaction**
6. **Production of ethanol by fermentation**
7. **Separation of bio molecule by dialysis**
8. **Demonstration of RTPCR**
9. **X ray Crystallography**
10. **HPTLC**

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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: - Enzymology & Industrial Biotechnology (BC-IV-LCBC-I)

Hours: 45

Objective(s): To understand Various technique and its application in biochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of enzyme inhibition
2. Analyse the effect of different parameter
3. Prepare the beer, wine
4. Prepare biofertilizer
5. Learn the bioherbicide.

List of Experiment

1. Purification of enzyme by ammonium sulphate precipitation and dialysis.
2. Determination of Vmax :
3. Determination of Km
4. Effect of temperature, pH, Substrate concentration on enzyme activity.
5. Effect of activator on enzyme activity(Nacl, Zncl,)
6. Determination of enzyme inhibition.
7. Production of alcohol by starch
8. Production of biodiesel..
9. Production of wine.
10. Production of beer
11. Preparation of bio herbicide. (From neem oil)
12. Preparation of biofertilizer by Azotobacterium
13. Demonstration of biogas plant
14. Demonstration of patent filing and process.
15. Estimation of alanine transaminase from human serum.

Reference Books

1. Plummer D. T. (2005) An Introduction to Practical Biochemistry, TATA McGraw-Hill.

2. Sadasivam S. and Manickam A. (2008) Biochemical Methods, 3rd edition, New Age International Publishers.

3. Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A Student Companion, I.K. International Pvt. Ltd., New Delhi.

4. Sawhney S.K. and Singh Randhir (2011) introductory practical Biochemistry, Narosa Publication House Pvt. Ltd.

5. Jayaraman J. (1981) Laboratory Manual in Biochemistry, New Age International Publishers

6. Aneja K.R. (2007) Experiments in Microbiology, Plant Pathology and Biotechnology, New Age International Publishers.

7. Kale V. and Bhusari K. (2010) Practical Microbiology: Principles and Techniques, Himalaya Publishing House.

8. Godkar P.B. and Godkar D.P. (2003) Textbook of Medical Laboratory Technology, Second Edition, Bhalani Publishing House.

9. Rajgopal G. and Toora B.D. (2005) Practical Biochemistry, 2nd edition, Ahuja Publishing House.

10. Maheshwari D.K. (2002) Practical Microbiology, S. Chand Publishing.

11. Rajan S. and Christy Selvi R. (2015) Experimental Procedures in Life Sciences, CBS Publishers and Distributors Pvt. Ltd.

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Semester Pattern effective from June 2019

Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: - Mol.Bio& Membrane biochemistry (BC-IV-LCBC-2)

Hours: 45

Objective(s): To understand varies technique and its application in biochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of Plasmid DNA
2. Analyse peptide fragment
3. Know the diffusion technique
4. Explaining permeability of membrane
5. Learn the denaturation of DNA.

List of Expriment

1. Isolation of Plasmid DNA.
2. Assessment of purity of DNA by 260/280 ratio.
3. Separation of peptide by PAGE
4. Demonstration of DNA amplification
5. Separation of DNA fragments by Agarose gel Electrophoresis.
6. Southern Blotting & Northern Blotting.
7. Study of hyper chromic effect on DNA.
8. Study of diffusion.
9. Effect of hypertonic solution on cell morphology.
10. Effect of hypotonic solution on cell morphology.
11. Effect of high temperature on permeability of cell membrane.
12. Effect of chemical on permeability of cell membrane.
13. Demonstration of drug penetration.
14. Digestion of cell wall.
15. Denaturation DNA.

Reference Books

1. Plummer D. T. (2005) An Introduction to Practical Biochemistry, TATA McGraw-Hill.

2. Sadasivam S. and Manickam A. (2008) Biochemical Methods, 3rd edition, New Age International Publishers.

3. Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A Student Companion, I.K. International Pvt. Ltd., New Delhi.

4. Sawhney S.K. and Singh Randhir (2011) introductory practical Biochemistry, Narosa Publication House Pvt. Ltd.

5. Jayaraman J. (1981) Laboratory Manual in Biochemistry, New Age International Publishers

6. Aneja K.R. (2007) Experiments in Microbiology, Plant Pathology and Biotechnology, New Age International Publishers.

7. Kale V. and Bhusari K. (2010) Practical Microbiology: Principles and Techniques, Himalaya Publishing House.

8. Godkar P.B. and Godkar D.P. (2003) Textbook of Medical Laboratory Technology, Second Edition, Bhalani Publishing House.

9. Rajgopal G. and Toora B.D. (2005) Practical Biochemistry, 2nd edition, Ahuja Publishing House.

10. Maheshwari D.K. (2002) Practical Microbiology, S. Chand Publishing.

11. Rajan S. and Christy Selvi R. (2015) Experimental Procedures in Life Sciences, CBS Publishers and Distributors Pvt. Ltd.

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Subject: Biochemistry (Honors)

B.Sc. Biochemistry Second Year (Semester-IV)

Title of the Paper: - Clinical & Plant biochemistry (BC-IV-LCBC-3)

Hours: 45

Objective(s): To understand varies technique and its application in biochemistry.

Course Outcome(s): The student will be able to

1. Gathering basic knowledge of Plant biochemistry
2. Analyse bilirubin fragment
3. Know the diffusion technique
4. Explaining permeability of membrane
5. Learn the denaturation of DNA.

List of Experiment

1. Glucose tolerance test
2. Estimation of bilirubin
3. Estimation of blood urea
4. Blood sugar determination by Folin – Wu method.
5. Estimation of creatine phospokinase.
6. Normal and abnormal constituents of urine.
7. Determination of blood cholesterol.
8. Determination of glucose by glucose oxidase method.
9. Estimation of glycosylated hemoglobin.
10. Estimation of LDH and its isozymes.
11. Estimation of alkaline phosphatase from serum.
12. Estimation of total protein and albumin from serum.
13. Determination of SGPT and SGOT
14. Estimation of serum amylase
15. Absorption of water by live & dead seeds.
16. Changes in carbohydrate, protein content during germination.
17. Induction of proteinases, amylases, and lipase during germination.

Reference Books

1. Plummer D. T. (2005) An Introduction to Practical Biochemistry, TATA McGraw-Hill.

2. Sadasivam S. and Manickam A. (2008) Biochemical Methods, 3rd edition, New Age International Publishers.

3. Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A Student Companion, I.K. International Pvt. Ltd., New Delhi.

4. Sawhney S.K. and Singh Randhir (2011) introductory practical Biochemistry, Narosa Publication House Pvt. Ltd.

5. Jayaraman J. (1981) Laboratory Manual in Biochemistry, New Age International Publishers

6. Aneja K.R. (2007) Experiments in Microbiology, Plant Pathology and Biotechnology, New Age International Publishers.

7. Kale V. and Bhusari K. (2010) Practical Microbiology: Principles and Techniques, Himalaya Publishing House.

8. Godkar P.B. and Godkar D.P. (2003) Textbook of Medical Laboratory Technology, Second Edition, Bhalani Publishing House.

9. Rajgopal G. and Toora B.D. (2005) Practical Biochemistry, 2nd edition, Ahuja Publishing House.

10. Maheshwari D.K. (2002) Practical Microbiology, S. Chand Publishing.

11. Rajan S. and Christy Selvi R. (2015) Experimental Procedures in Life Sciences, CBS Publishers and Distributors Pvt. Ltd.