



SU/BOS/Science/06

Date: 01/01/2024

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

The Head/Co-ordinator/Director
All Concerned Department (Science)
Shivaji University, Kolhapur.

Subject: Regarding syllabi of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (1.0) degree programme under the Faculty of Science and Technology.

B.Sc.-III (Sem. V & VI) as per NEP-2020 (1.0)			
1.	Mathematics	12.	Computer Science (Opt)
2.	Statistics	13.	Computer Science (Entire)
3.	Physics	14.	Information Technology (Entire)
4.	Microbiology	15.	Food Science and Technology (Entire)
5.	Industrial Microbiology	16.	Food Science
6.	Electronics	17.	Food Science and Quality Control (Entire)
7.	Chemistry	18.	Food Technology & Management (Entire)
8.	Sugar Technology (Entire)	19.	Biochemistry
9.	Geology	20.	Biotechnology (Optional/Vocational)
10.	Zoology	21.	Biotechnology (Entire)
11.	Botany	22.	Environmental Science (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2024-2025 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2024 & March/April 2025. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

By Registrar
Dr. S. M. Kubal

Copy to:

SHIVAJI UNIVERSITY, KOLHAPUR.



“A⁺⁺”Re-accredited by NAAC

(2021) with CGPA-3.52

NEW SYLLABUS FOR

**B.Sc. Part III
BIOCHEMISTRY
(Optional)**

CBCS PATTERN

SYLLBUSTO BEIMPLEMENTEDFROMJUNE 2024-2025

B. Sc. – III C B C S PATTERN (With effect from 2024-25)

S E M E S T E R – V															
Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME							
		THEORY				PRACTICAL			THEORY				PRACTICAL		
		Credits	No. of lectures	Hours		Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min
1	DSE – E57	2	6	5		2	5	4.2		2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL	
2	DSE – E58	2								2	50				
3	DSE – E59	2	6	5		2	5	4.2		2	50	100	35		
4	DSE – E60	2								2	50				
5	AECC-1A	2	4	3.2	----	----	----	2	50	50	18				
	TOTAL	10	16	13.2		8	20	8.4			250				
S E M E S T E R – VI															
1	DSE – F57	2	6	5		2	5	4.2		2	50	100	35		As per BOS Guide-lines
2	DSC – F58	2								2	50				
3	DSE – F59	2	6	5		2	5	4.2		2	50	100	35		
4	DSE – F60	2								2	50				
5	AECC-1A	2	4	3.2	----	----	----	2	50	100	35				
	TOTAL	10	16	13.2		8	20	8.4			250				
• Student contact hours per week : 32 Hours (Min.)										• Total Marks for B.Sc.-III (Including English) : 1100					
• Theory and Practical Lectures : 48 Minutes Each										• Total Credits for B.Sc.-III (Semester V & VI) : 36					
• DSC- Discipline Specific Core Course. four subjects (Courses) from B.Sc.-III CBCS curriculum Biochemistry (opt.),															
• AECC- Ability Enhancement Compulsory Course (1A & 1B)- English															
• Practical Examination will be conducted annually for 50 Marks per course (subject).															
• Except English, combined passing for four theory papers of 50 marks each. i.e. Min. 18 marks required for passing out of 50.															
• There shall be separate passing for theory and practical courses.															

REVISED SYLLABUS FOR BACHELOR OF SCIENCE PART- III: BIOCHEMISTRY

- 1. **TITLE:** Biochemistry
- 2. **YEAR OF IMPLEMENTATION:** Revised Syllabus will be implemented from June 2024 onwards.
- 3. **PREAMBLE:**

This syllabus is framed to give sound knowledge with understanding of Biochemistry to undergraduate students of three years of B.Sc. degree course. Students learn biochemistry as a separate subject from B.Sc. I. The goal of the syllabus is to make the study of biochemistry popular, interesting and encouraging to the students for higher studies including research. The new and updated syllabus is based on a basic and applied approach with vigor and depth. At the same time precaution is taken to make the syllabus comparable to the syllabi of other universities and the needs of industries and research.

The syllabus is prepared after discussion at length with number of faculty members of the subject and experts from industries and research fields. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

- 4. **GENERAL OBJECTIVES OF THE COURSE:**
 - 1) To make the students knowledgeable with respect to the subject and practicable applicability.
 - 2) To promote understanding of basic and advanced concepts in biochemistry.
 - 3) To expose the students to various emerging areas of biochemistry.
 - 4) To prepare students for further studies, helping in their bright career in subject.
 - 5) To expose the students to different processes used in industries and research fields.
 - 6) To develop their ability to apply the knowledge of Biochemistry in day to day life.
 - 7) To prepare the students to accept the challenges in life sciences.
 - 8) To develop skills required in various industries, research labs and in the field of human health.

- 5. **DURATION:** The course shall be a full time course.
- 6. **PATTERN:** Pattern of Examination will be Semester.
- 7. **MEDIUM OF INSTRUCTION:** The medium of instructions shall be in English.
- 8. **STRUCTURE OF COURSE -**

1) B.Sc.III: Total Number of Papers-8

Sr.No.	Subjects	Marks
	SEMISTER V	
1.	Course –IX	40+10
2.	Course – X	40+10
3.	Course – XI	40+10
4.	Course – XII	40+10
	SEMISTER VI	
5.	Course– XIII	40+10
6.	Course – XIV	40+10
7.	Course – XV	40+10
8.	Course – XVI	40+10
	PRACTICAL	
1.	Practical Course	200
Total		600

2) Structure and Titles of Papers of B.Sc. III Course:

SEMESTER V

- Papers
- Course - IX (DSE – E57) -Molecular Biology
 - Course - X (DSE–E58)-Genetic Engineering
 - Course - XI (DSE – E59) -Biomembrane Transport And Cytoskeleton
 - Course–XII (DSE–E60)-Biochemical Techniques and Bioinformatics

SEMESTER VI

- Papers
- Course-XIII (DSE–F57)- Neurochemistry
 - Course-XIV (DSE –F58)- Cancer Biology
 - Course-XV (DSE–F59)- Clinical Biochemistry and Immunochemistry
 - Course - XVI (DSE – F60) -Fermentation Technology

9. SCHEME OF TEACHING AND EXAMINATION:

[The scheme of teaching and examinations should be given as applicable to the course/paper concerned.]

Sr. No.	Subject/Paper	Teaching Scheme (Hrs/week)		
		L	P	Total
1	Course–IX and XIII	3		
2	Course– X and XIV	3		
3	Course– XI and XV	3		
4	Course– XII and XVI	3		12
5	Practical		20	20
	Total			32

10. SCHEME OF EXAMINATION:

- The examination shall be conducted at the end of each semester of an academic year.
- Each theory paper shall carry 40 marks.
- The evaluation of the performance of the students in theory papers shall be on the basis of each semester examination of 200 marks.
- The evaluation of the performance of the students in practical shall be on the basis of annual examination of 200 marks
- Question Paper will be set in view of the/in accordance with the entire syllabus and preferably covering each unit of syllabi.

11. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENT OF PAPERS FOR REVISED SYLLABUS

Sr. No.	TITLE OF OLD PAPER	TITLE & CODE OF NEW PAPER
1	Paper IX – Molecular Biology	Course- IX (DSE – E57) - Molecular Biology
2	Paper X – Cell Biology	Course -XI (DSE – E58)- Genetic Engineering
3	Paper XI- Biomembrane Transport And Cytoskeleton	Course -XI (DSE – E59)- Biomembrane Transport And Cytoskeleton
4	Paper XII- Biochemical Techniques	Course – XII (DSE – E60)- Biochemical Techniques and Bioinformatics
5	Paper XIII – Neurochemistry	Course- XIII (DSE–F57)– Neurochemistry
6	Paper XIV – Cancer Biology	Course- XIV (DSE– F58)- Cancer Biology
7	Paper XV –	Course- XV (DSE – F59)–

	Clinical Biochemistry	ClinicalBiochemistryandImmunochemistry
8	PaperXVI– Fermentation Technology	Course -XVI(DSE – F60)- Fermentation Technology
9	Practical	Practical

12. OTHERFEATURES:

- (A) **LIBRARY:**ReferenceandTextBooks,JournalsandPeriodicals,
Reference book list is mentioned below the course syllabus.
- (B) **SPECIFICEQUIPMENTS :** Necessaryto run theCourse –
OHP,Computer,L.C.D., Projector
- (C) **LABORATORYSAFETYEQIPMENTS:**
- 1) Fireextinguisher
 - 2) Firstaidkit
 - 3) Fumigation chamber
 - 4) Stabilizedpowersupply
 - 5) Insulatedwiringforelectric supply.
 - 6) Goodvalves, distribution pipes ®ulators for gas supply.
 - 7) Operationalmanualsfor instruments.
 - 8) Emergencyexits

SHIVAJI UNIVERSITY, KOLHAPUR
B.Sc.-III Biochemistry Semester V

COURSE- IX(DSE– E57)MOLECULAR BIOLOGY
(Credits2,Total lectures- 45)

Unit I

[23]

Introduction to Transcription and Translation

1. Eucaryotic transcription and regulation: (all point at introductory level)
 - a. RNA polymerase structure and assembly,
 - b. RNA polymerase I, II, III,
 - c. Transcription initiation, elongation and termination, activation and regulation
2. Splicing, RNA editing, Nuclear export of mRNA, mRNA stability, catalytic RNA
3. The translation machinery, ribosomes, composition and assembly,
4. Mechanism of eukaryotic translation
 - a. Initiation
 - b. Elongation
 - c. Termination

Unit II

[22]

DNA repair and mutation

1. DNA repair
2. Photoreactivation,
3. Mismatch correction
4. SOS repair.

Types of Mutation

- a. Point mutations: -Nonsense and Missense
- b. Intragenic and intergenic suppression,
- c. Frameshift mutations,
- d. Physical, chemical and biological mutagens.

Recommended books:

1. Stryer L (1995) Biochemistry, 4th edition, W. H. Freeman & company, New York.
2. Nelson and Cox, (2010), Lehninger's Principles of biochemistry.
3. Watson J. D., Hopkins, N. H., Roberts, J. W., Steitz, J. A. and Weiner, A. M. (1988) Molecular biology of the gene, 4th edition, The Benjamin/Cummings publishing companies, inc, California.
4. Benjamin Lewin (1999) Genes (all volumes), Oxford University Press, Oxford.
5. Weaver R. F. (1999) Molecular biology, WCB McGraw-Hill companies, Inc, New York.
6. Brown T. A. (1995) Essential molecular biology, vol. I, A practical approach, IRL press, Oxford.
7. Genes and Genomes Maxine Singer and Paul Berg

COURSE- X(DSE– E58)GENETIC ENGINEERING
(Credits2,Total lectures- 45)

Unit I

Introduction and tools of Genetic Engineering

[22]

1. Enzymes: -Restriction Endonuclease – introduction to class I, II, and III, eg EcoRI, BamHI, b. Reverse transcriptase c) S1 Nuclease d) DNA ligases c) Alkaline Phosphatase
2. Cloning vectors: -properties and construction of Plasmid pBR- 322, Cosmids, lambda phage
3. Passenger DNA- cDNA synthesis
4. Host: E. coli

Unit II

Techniques and Application of Genetic Engineering

[23]

1. Gene cloning Techniques – hybridisation, rDNA synthesis, gene transfer methods, screening
2. Production of human insulin by DNA technology
3. Principle, Working and application of PCR
4. Blotting techniques- southern and western blotting and their application
5. Application of genetic engineering.

Recommended books:

1. Genetic engineering by verma p.s
2. Principles of Gene Manipulation: An Introduction To Genetic Engineering” by Old RW and Primrose SB
3. Genetic Engineering (Oxford Higher Education)” by Smita Rastogi and Neelam Pathak
4. Genetic Engineering” by LM Narayanan and A Mani
5. Genetic Engineering” by Verma P S and Agarwal V K

COURSE-XI(DSE– E59)BIOMEMBRANE TRANSPORTANDCYTOSKELETON
(Credits2,Total lectures- 45)

Unit I

[22]

Transport across biomembranes

Structure and function of plasma membrane (Singer and Nicholson model)

1. Active, passive and facultative transport
2. Ion channels.
3. Symport and antiport system.
4. Organisation and significance of
 - a. $\text{Na}^+ - \text{K}^+$ ATPase,
 - b. $\text{Na}^+ - \text{H}^+$ ATPase,
 - c. Ca^{++} -ATPase pumps.
5. Endocytosis,
6. Pinocytosis and
7. Phagocytosis,
8. Receptor mediated endocytosis, transcytosis.

Unit III

[23]

Specialized transport systems and Cytoskeleton

1. Gap junctions transport,
2. Nuclear pores transport,
3. Transport of water – Aquaporins
4. Elements of cytoskeleton
 - a. Microtubules,
 - b. Microfilaments and
 - c. Intermediary filaments.

Recommended books:

1. Molecular Cell Biology by H. Lodish, David Baltimore, et al W.H. Freeman Publication, 1996
2. Biological Membranes Findlay and Evans
3. Biochemistry of Tissues by Banks
4. Cell by Cooper
5. Stryer L (1995) Biochemistry, 4th edition, W. H. Freeman & company, New York.
6. Nelson and Cox, (2010), Lehninger's Principles of biochemistry.

COURSE- XII(DSE– E60) BIOCHEMICAL TECHNIQUE ANDBIONIFORMATICS
(Credits2,Total lectures- 45)

Unit I

[22]

Basicofbioinformatics

1. Introductionto bioinformatics
2. Database
3. Informationsource(NCBI,GDB,MGD)
3. Informationsource(NCBI,GDB,MGD)
4. Databaseretrievaltool(ENTREZ,OMIM,PubMed)
5. Databasesimilaritysearching(BLAST)
6. Applications

UnitII

[23]

Chromatography

1. Principle,techniqueandapplicationsof
(Discussionshouldincludeselectionofmatrix,columnpackingsampleapplication mechanical of separation important application and advantages)
 - a. Affinitychromatography,
 - b. HPLC
 - c. Reversephasechromatography,
 - d. Gaschromatography
2. Electrophoresis
 1. Isoelectricfocusing,
 2. Capillaryelectrophoresis
 3. Pulsefield gel electrophoresis
 4. 2D electrophoresis

Recommendedbooks:

- 1) Protein PurificationbyRobertScopes,SpringerVerlagPublication,1982
- 2) Toolsin BiochemistryDavid Cooper
- 3) MethodsofProtein andNucleicacidResearch,OstermanVolII–III
- 4) CentrifugationD. Rickwood
- 5) PracticalBiochemistry, Vth edition,Keth,WilsonandWalker.
- 6) Bioinformaticsbyrastogi

Semester VI

COURSE-XIII(DSE–F57) NEUROCHEMISTRY (Credits 2, Total lectures- 45)

Unit I

[22]

Nervous system

An overview of

1. Central Nervous System,
2. Peripheral and Autonomic Nervous system.
3. Cells of Nervous System – Neurons, Astrocytes, Glial cells, Oligodendrocytes and Schwann cells.

Neurotransmission

1. Membrane potentials,
2. Action potential –
 - a. Depolarization,
 - b. Repolarization and
 - c. Hyperpolarization,
3. Resting potential
4. Axonal Neurotransmission

Unit II

[23]

Neurotransmission and Disease of nervous system

1. Action of neurotransmitters
 - a. Acetyl choline,
 - b. GABA,
2. Agonists and Antagonists – their mode of action and effects
3. Disease of nervous system
 1. Parkinson's disease,
 2. Alzheimer's disease,
 3. Schizophrenia, and
 4. Multiple sclerosis.

Recommended books:

1. Neurochemistry by Ferdinand Hucho, VCH Publication, 1986
2. Molecular cell Biology, by Lodish, Baltimore, et al W.H. Freeman & Co. 1996
3. Basic Neurochemistry by M.P. Spiegel

COURSE-XIV(DSE–F58)CANCER BIOLOGY

(Credits2,Total lectures- 45)

Unit I

[22]

Cancer cell

1. Characteristics of cancer cell
2. Types of cancer
 - a. Benign
 - b. Malignant
3. Metastasis
4. Tumor markers (CEA, AFP)

Carcinogen

1. Chemical: - Base analogues, Alkylating agents and intercalating agents
Physical: - Radiation energy
Biological mutagens: - RNA and DNA Tumor viruses and Retrovirus viral oncogene

Unit II

[23]

Chemical Carcinogenesis and therapies

1. Genetic and epigenetic carcinogens: - Src and Ras gene
2. Procarcinogens and cocarcinogens,
3. Mutagenic agents (Nicotine),
4. Testing for carcinogenicity - Ames test.
5. Physical, chemical and other therapies

Recommended books:

1. Klaassen CD, Amdur MO & Doull J (1986) Casarett and Doull's Toxicology, IIIrd edition, Macmillan publishing company, New York. 26
2. Williams PL & Burson JL (1985) Industrial Toxicology, Van-Nostrand Reinhold, New York.
3. Hayes AW (1988) Principles and methods of toxicology, IIrd edition, Raven press New York.
4. Stewart C P & Stolman A (1960) Toxicology, vol II, Academic press, New York.

**COURSE- XV(DSE–F59) CLINICALBIOCHEMISTRYAND IMMUNOCHEMISTRY
(Credits2,Total lectures- 45)**

Unit I

[22]

Laboratory setup and safety and enzymes in diagnosis and monitoring of disorders
Requirementsofsettingupofclinicallaboratory,SIunitsinclinicallaboratory,collection preparation, preservation, and handling of clinical samples, quality control,

1. Useof enzymein clinicalbiochemistry
 - a. LDH,
 - b. SGPT,
 - c. SGOT,
 - d. Acidandalkalinephosphatase,
 - e. amylase,

Indiagnosisandmonitoringofdisorders

Unit II

[23]

Liver

1. Bilirubinmetabolism,
2. Typesofjaundiceand clinical assesment,
3. Kidneyandheart
 - a. Glomerularfiltrationrate
 - b. Renalthresholdand clearancevalue
 - c. Roleofenzyme inassessmentofmyocardialinfraction
4. Immunochemistry(introductorylevel)
 - a. Naturalandacquired immunology
 - b. Natureof immuneresponse
 - c. TcellandBcell
 - d.Structure of IgG
 - e.Antigen–antibodyinteraction f.Phagocytosis by microphages
 - g.Radial,single,anddoublediffusionmethod

Recommendedbooks:

1. ClinicalChemistrybyKaplanL.A. and PesceA.J. C. V. Mosby,1989
2. ClinicalBiochemistrybyW.J.Marshall and S. K.Bangert, ChurchillLivinston N.Y. 1995
3. PracticalClinicalBiochemistry(Varley)byGowenlock
4. BiochemicalAspects ofHuman DiseasesbyElkeles and Tavill
5. TextbookofMedicalPhysiologybyA.C.GuytonandJ.E.Hall,W.B.Saunders Publication, 9th Edition , 1996

COURSE-XVI(DSE–F60)FERMENTATION TECHNOLOGY
(Credits2,Total lectures- 45)

Unit I

[22]

Upstream Processing

1. Microbialcellgrowthand kinetics
2. GrowthMedium–microandmacronutrients
3. Designandpartsoffermenter
4. Constructionmaterials,

Varioussterilizationtechniquesfor

- a. Solid,
- b. Liquid
- c. Gases,
- d. Aerationandagitation,foam, auxillaryequipments

Unit II

[23]

Fermentationanddownstream processing

1. Batch,
2. Fed-batchand
3. Continuous fermentation
4. Principleoftechniques-cellhomogenization,liquid-liquidextraction,filtration,distillation, ultrafiltration
5. Industrialproductionofalcohol

Recommendedbooks:

- 1) Moo-YoungM.ed.(1985)ComprehensiveBiotechnologyvol:I& II,Pergamon Press N.Y.
- 2) RatledgeCandKristiansenB.ed.(2001)BasicBiotechnology2nded.Cambridge Univ Press Cambridge.
- 3) OldR.WandPrimoseS.D(1995)PrinciplesofGeneManipulation5thed. Blackwell Scientific Pub. Oxford.
- 4) BaileyJ.EandOllisD.F.(1986)BiochemicalEngineeringFundamentals 2nded.McGraw Hill Book Company, N. Delhi.
- 5) AibaS, HumphreyA.E.and N. F.Millis(1973)BiochemicalEngineering,2nd EditionUniversityof Tokyo Press, Tokyo, Japan.

- 6) Stanbury P.F., Whitaker A., and Hall S.J. (1997) Principles of Fermentation Technology 2nd ed. Aditya Books Pvt. Ltd, N. Delhi.
- 7) Mukhopadhyaya S.N. (2001) Process Biotechnology Fundamentals. Viva Books Pvt. Ltd. N. Delhi.
- 8) Rehm H. J. and Reed G. (1985) Biotechnology vol. I & II. VCH, Basel.
- 9) Stainer R. Y., Ingraham J. L., Wheelis M. L. and Painter P. R. (1987) General Microbiology 5th Edition, Macmillan Press Ltd. London

Practical Course

Figures show to the right indicating number of practical/s required.

A] Colorimetric estimations:-

1. Estimation of bacterial protein by Folin cio-calteu method. (1)
2. Quantitative estimation of amino acids by using ninhydrin method. (1)
3. Estimation of alcohol by $K_2Cr_2O_7$. (1)
4. Estimation of total carbohydrate by Phenol- H_2SO_4 method. (1)
5. Estimation of reducing sugar by DNSA method. (1)

B] Enzyme study:-

6. Study of amylase enzyme assay. (2)
7. Study of optimum pH of Amylase. (1)
8. Study of optimum temperature of Amylase. (1)
9. Study of substrate concentration on Amylase. (1)
10. Study of effect of activator on amylase activity. (1)
11. Study of effect of inhibitor on amylase activity. (1)
12. Production of Alcohol from Baker's yeast. (2)

C] Isolations:-

12. Isolation of Chromosomal DNA from liver. (2)
13. Isolation & characterization of photosynthetic pigment chlorophylla & b from plant. (2)
14. Isolation and characterization of Glycogen from rat liver. (1)

D] Chromatography:-

15. Preparation and activation of TLC plates. (1)
16. Separation of amino acids or sugars by using TLC. (1)
17. Separation and identification of amino acid mixture by 2D paper chromatography. (1)
18. Determination of capacity of ion exchanger resin [Dowex 50]. (1)

E] Electrophoresis & Other Instrument based practicals:-

19. Preparation of gel and its casting in tray/tube. (1)
20. Separation of protein by gel electrophoresis. (1)
21. Separation of DNA by agarose gel electrophoresis. (1)
22. Titration curve of glycine by using pH meter. (1)
23. Detection of changes in confirmation of Protein by viscosity measurement. (1)
24. Study of cell lysis by homogenization or sonication method. (1)
25. Study of U.V. absorption spectra of biomolecules (Protein, nucleic acid, pigments). (1)
26. Detection of blood glucose by using Glucometer. (1)

F] Demonstration:-

27. Demonstration of Western blotting technique. (2)
28. Demonstration of PCR (1)
29. Demonstration of HPLC (1)
30. Demonstration of Fermenter (1)
31. Demonstration of transport of amino acids across the intestine. (1)
32. Separation of proteins by using molecular sieve chromatography. (1)

Recommended Books:-

1. An introduction to Practical biochemistry - David Plummer,
2. Laboratory manual in biochemistry - Jayaraman, Wiley Eastern Ltd. New Delhi.
3. Modern Experimental Biochemistry - Rodny Boyer, Addison Wesley - Longman Pvt Ltd.
4. Biochemical methods - Sadashivam and Manikam
5. Introductory Practical Biochemistry - Sawhney S.K. and Randhir Singh (Narosa publication).
6. Hawk's Physiological Chemistry - Oser
7. Viva and Practical Biochemistry - Dr. A. C. Deb (New central book Limited).

Practical Examination

A) The practical examination will be conducted on four (4) consecutive days for not less than 5 hours on each day of the practical examination.

B) Each candidate must produce a certificate from the Head of the Department in his/her college stating that he/she has completed in a satisfactory manner the practical course on the guidelines laid down from time to time by Academic Council on the recommendation of Board of studies and has been recorded his/her observations in the laboratory journal and written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journal at the time of practical examination. Candidates have to visit the least Two (2) places of biochemical interest (Pharmaceutical industry, Dairy, Food, Research institutes etc.) and submit the report of their visit at the time of examination. The report should be duly certified by the Head of the Department.

List of the minimum equipments and related requirements for B.Sc. III

- | | |
|--|---------------|
| 1) Rotary shaker | : One |
| 3) Centrifuge (High Speed) | : One |
| 4) Hot plate | : One |
| 5) Hot air oven | : One |
| 6) Incubator | : One |
| 7) Spectrophotometer | : One |
| 8) Water bath | : One |
| 9) Separate room for fine instruments of size 10' x 15' feet dimension | : One |
| 10) Electrophoresis assembly | : one |
| 11) Distillation assembly | : One (Glass) |
| 12) Reflux assembly | : Four |

13) Refrigerator	:One
14) Colorimeter	:One
15) Chromatographyassembly	:Four
16) Chromatographycolumn	:Four
17) pHmeter[digital]	:Two
18) Viscometer	:Four
19) Homogenization	:One
20) Sonicator	:One
21) Spectrophotometer	:One
22) Glucometer.	:One
23) Westernblottingassembly	
24) PCR	
25) HPLC	
26) Fermentor	

**NATUREOFQUESTIONPAPER FORTHEORYISSAMEANDCOMMONAS PER
UNIVERSITY PATTERN**

**THENATUREOFQUESTIONPAPERFORB.SC.PARTIIIBIOCHEMISTRY
PRACTICAL EXAMINATION WILL INCLUDE:**

- Q.Major Experiment
- Q.Minor Experiment
- Q.Journal
- Q.Project Report:
- Q.StudyTourReport
