Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/271 **Date: 03/05/2025**

To,

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

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

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 syllabi, nature of question paper B.Sc. Part-II (Sem. III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Pollution	8.	Food Science (Entire)
2.	Biochemistry	9.	Biotechnology (Entire)
3.	Food Science and Quality Control	10.	Environmental Science (Entire)
4.	Computer Science (Optional)	11.	Information Technology (Entire)
5.	Biotechnology (Optional/Vocational)	12.	Food Science and Technology (Entire)
6.	Animation (Entire)	13.	Food Technology & Management (Entire)
7.	Computer Science (Entire)	14.	All Faculty UG Part II Environmental Studies (VEC)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(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 2025 & March/April 2026. 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,

Yours faithfully,

Dy Registrar
Dr. S. M. Kubal

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

Shivaji University, Kolhapur

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Accredited By NAAC with 'A' Grade

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus for Bachelor

of Science Part – II

(Sem III & IV)

BIOCHEMISTRY

(To be implemented from 2025-26 onwards as per NEP 2020)

Shivaji University, Kolhapur

Revised Syllabus for Bachelor of Science Part – II: Biochemistry

1. TITLE: Biochemistry

2. YEAR OF IMPLEMENTATION: - Revised Syllabus will be implemented from June, 2025 onwards.

3. PREAMBLE:

This syllabus is framed to give sound knowledge with understanding of biochemistry to undergraduate students at first year 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/ PAPER:

1) To make the students knowledgeable with respect to the subject and its 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 the subject.
5) To expose the students to different processes used in industries and in research field.
6) To prepare the students to accept the challenges in life sciences.
7) To develop skills required in various industries, research labs and in the field of human health.

5. Program Specific Outcomes:

- Understand basics of Biochemistry.
- Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learnt in the classroom.
- Develop the ability to apply the knowledge acquired in classroom and laboratories to specific problems in theoretical and experimental Biochemistry.
- Identify the area of interest in the academic research and development.
- Perform job in various fields like food, pharmaceutical, agriculture, health care, public services and business etc.
- Be an entrepreneur with precision, analytical mind, innovative thinking, and clarity of thought, expression and systematic approach.

6. DURATION

- The course shall be a full-time course.

7. **MEDIUM OF INSTRUCTION:**
The medium of instruction shall be in English.

8. **ELIGIBILITY FOR ADMISSION**: - As per guidelines given by Shivaji University, Kolhapur and by following rules and regulations given by Govt. of Maharashtra

9. **PATTERN**:-Pattern of examination will be semester

10. STRUCTURE OF THE COURSE - B. Sc. II Biotechnology (Optional/Vocational) SECOND YEAR (SEMESTER III / IV) (NUMBER OF PAPERS 4)

Sr. No.	**Subjects/Papers**	**Theory**	**Internal**	**Total Marks**
1	Paper-V	40	10	50
2	Paper-VI	40	10	50
3	Paper-VII	40	10	50
4	Paper-VIII	40	10	50
	Practical-III			50
	Practical-IV			50
			Total	300

SHIVAJI UNIVERSITY,KOLHAPUR

NEP-2020 (2.0): Credit Framework for UG(B. Sc.) Programme under Faculty of Science and Technology

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP /CC/RP	Total Credits	Degree/Cum. Cr. MEME
	Course-1	**Course-2**	**Course-3**						
SEMI (4.5)	DSC-I(2) DSC-II (2) DSC P-I(2)	DSC-I(2) DSC-II (2) DSC P-I(2)	DSC-I(2) DSC-II (2) DSC P-I(2)	OE-1(2) (T/P)		IKS-I(2)		**22**	**UG Certificate 44**
SEMII (4.5)	DSC-III(2) DSC-IV (2) DSC P-II(2)	DSC-III(2) DSC-IV (2) DSC P-II(2)	DSC-III(2) DSC-IV (2) DSC P-II(2)	OE-2(2) (T/P)		VEC-I(2) (Democracy, Election and Constitution)		**22**	
Credits	**8(T)+4(P)=12**	**8(T)+4(P)=12**	**8(T)+4(P)=12**	**2+2=4 (T/P)**	**--**	**2+2=4**	**--**	**44**	**Exit Option:4 credits NSQF/Internship/Skill courses**
	MAJOR		**MINOR**						
SEMIII (5.0)	Major V(2) Major VI (2) Major P III (2)	--	Minor V(2) Minor VI (2) Minor P III(2)	OE-3(2) (T/P)	VSC I (2) (P) (Major specific) SEC I(2) (T/P)	AEC I(2) (English)	CC-I (2)	**22**	**UG Diploma 88**
SEMIV (5.0)	Major VII(2) Major VIII (2) Major P IV (2)	--	Minor VII(2) Minor VIII (2) Minor P IV (2)	OE-4(2) (T/P)	SEC-II(2) (T/P)	AEC-II(2) (English) VEC-II(2) (Environmental studies)	CEP-I(2)	**22**	
Credits	**8(T)+4(P)=12**		**8(T)+4(P)=12**	**2+2=4(T/P)**	**4(T/P)+2(P)=6**	**2+4=6**	**2+2=4**	**44**	**Exit Option:4 credits NSQF/Internship/Skill courses**
SEMV (5.5)	Major IX(2) Major X (2) Major P V (4)	Major I (ELEC)(2) Major P-I (ELEC) (2)	-	OE-5(2) (T/P)	VSC II (2) (Major specific)(P)	AEC III(2) (English)	**OJT (04)**	**22**	**UG Degree 132**
SEMVI (5.5)	Major XI(2) Major XII (2) Major P VI (4)	Major II (ELEC)(2) Major P-II(2) (ELEC)	-		VSC III (2) (Major specific) (P) SEC III(2) (T/P)	AEC IV(2) (English) IKS 2 (Major specific) (2)	**FP-(02)**	**22**	
Credits	**8(T)+8(P)=16**	**4(T)+4(P)=8**	**-**	**2(T/P)**	**2(T/P)+4(P)=6**	**4+2=6**	**4+2=6**	**44**	
Total Credits	**40+20=60**		**24**	**10**	**12**	**16**	**10**	**132**	**Exit Option**

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

Biochemistry Paper- V

DSC-V Enzymes and Metabolism-I

Objectives-

- To make students aware of fundamentals of Enzymology.
- To make Students aware of techniques of enzymology.
- To introduce vide areas in Enzymology.

Paper- V: -DSC- Enzymology		
	Credit – I	
	Introduction to enzymes **Nature of enzymes** - protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. Unit of enzyme activity – definition of IU, enzyme turn over number and nature of non-enzymatic and enzymatic catalysis. Specific activity. Enzyme specificity. Concept of active site, ES complex, specificity. **Features of enzyme catalysis** Factors affecting the rate of chemical reactions, collision theory, Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.	15
	Credit- II	
	Characterization: Effect of enzyme concentration, substrate concentration, pH and temperature. Michaelis – Menten equation,Lineweaver – Burk(L-B) plot. **Mechanism of action of enzymes** General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues. **Isoenzymes:Detection**, nature, importance. Lactate dehydrogenase as an example. Multi enzyme complex – Pyruvate dehydrogenase complex. – Composition, subunits, assembly, enzymatic reaction functions.RNA as an enzyme. (Ribozymes).Industrial and medical application of enzymes.	15

Learning Outcomes-

Students should be able to understand

- It provide fundamental knowledge on enzymes and their importance in biological reactions.
- Students will understand the difference between a chemical catalyst and biocatalyst

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

Biochemistry Paper- VI

DSC-VI Bioenergetics and Metabolism

Objectives-

- This course introduces foundation of metabolism
- Student will learn metabolism and Bioenergetics.

Paper-VI: -DSC-VI BIOENERGETICS AND METABOLISM		
	Credit—I	
	Bioenergetics: Concepts of free energy, state functions, equilibrium constant. Coupled reactions, energy charge, ATP cycle, phosphorylation potential. Standard energy of hydrolysis of ATP, PEP, 1,3 BPG and thioesters. Redox reactions, standard redox potentials and Nernst equation. Universal electron carriers. **Basic design of metabolism** Autotrophs, heterotrophs, metabolic pathways, catabolism, anabolism, ATP as energy currency, reducing power of the cell**.** **Glycolysis, Gluconeogenesis, pentose phosphate pathway and Glycogen Metabolism Glycolysis -** a universal pathway, reactions of glycolysis, fermentation, fates of pyruvate, feeder pathways for glycolysis, galactosemia. Synthesis of glucose from non-carbohydrate sources,pentose phosphate pathway and its importance. Glycogenesis and glycogenolysis, regulation of glycogen metabolism, glycogen storage diseases. **Citric acid cycle** Production of acetyl CoA, reactions of citric acid cycle, anaplerotic reactions, amphibolic role, regulation of citric acid cycle, glyoxalate pathway, coordinated regulation of glyoxalate and citric acid pathways.	15
	Credit—II	
	Biological oxidation: Ultra structure of mitochondrion, electron transport chain. Electron transport complexes Complex I, II, III and IV. Uncouplers and inhibitors of respiration (Rotenone, antimycin. cyanide and 2,4 DNP). Oxidative phosphorylation, P/O ratio. Formation of ATP-Outline of Mitchell's hypothesis. Substrate level phosphorylation with examples. **Metabolism of lipids:** Oxidation of fatty acids –β-oxidation of even number saturated fatty acids. Energetics of β-oxidation. Biosynthesis of even number saturated fatty acids. Ketone bodies formation. **Metabolism of amino acids:** General reaction of amino acid degradation – Transamination, deamination and decarboxylation. Ketogenic and glucogenic amino acids. Urea cycle and its significance.	15

Learning Outcomes-

- Students should be able to understand
- Fundamentals of Bioenergetics.
- Significance of Biological oxidation.
- Metabolism of carbohydrates, Lipids and Amino acids.

Reference Books: -

1. Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry.
2. Biochemistry - Lubert stryer.
3. Text book of Biochemistry and Human Physiology - G .P. Talwar.
4. Harper's Review of Physiological Chemistry - H. A. Harper.
5. Fundamentals of Biochemistry - J. L.J ain.
6. Biochemistry - U. Satyanarayan.

Shivaji University Kolhapur

B.Sc. Part-2 NEP, Syllabus with effect from June, 2025

B.Sc. Part-II Semester III

Practical syllabus

Biochemistry Practical III: Enzymology and Estimations

Sr No	Name of The Experiment
	Enzymology
1	Isolation of urease and demonstration of its activity
2	Isolation of acid phosphatase and demonstration of its activity
2	Determination of specific activity of salivary amylase by DNS
3	Influence of substrate concentration and pH on the rate of enzymatic reaction
4	Determination of optimum temperature of salivary amylase
Volumetric estimations:	
5.	Estimation of lactose in milk by Fehling's or Benedict's method. (1)
6.	Estimation of total chlorides in urine by Volhard's method (1)
7.	Estimation of vitamin-C in biological samples & tablet by 2, 6 dichlorophenol indophenol method. (1)
8.	Determination of saponification value of oil.

Practical outcome-

1. The students will get detailed and comprehensive knowledge on the various practical aspects of biochemical techniques.
2. The students will be able to analyze biochemically different biological samples.
3. Students will get practical knowledge regarding preparation of biochemically important buffers, estimating the biomolecules in each sample by using standard analytical techniques.

Books recommended for Practicals

1) Stains and Staining procedures by Desai and Desai.
2) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
3) Bacteriological techniques by F. J.Baker.
4) Introduction to Microbial techniques by Gunasekaran.
5) Biochemical methods by Sadashivan and D.Manickam.
6) Laboratory methods in Biochemistry by J.Jayaraman.
7) Experimental Microbiology – Patel &Patel

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

OE Practical –III: Practical Course on Food Purity and Adulteration Marks-50

Objectives:

- To develop practical skills for detecting adulterants in various food products.
- To understand simple and effective methods for identifying food purity.
- To promote awareness about food safety and consumer health.

Group 1

1. Detection of detergent in milk.
2. Detection of starch in milk and milk products.
3. Detection of smashed potatoes and sweet potatoes and other starches in ghee/butter.
4. Detection of papaya seeds in black peppers.
5. Detection of artificial/synthetic colors in chilli powder.
6. Detection of cassia bark in cinnamon.
7. Detection of grass seeds coloured with charcoal dust in cumin seeds.
8. Detection of lead chromate in turmeric whole.

Group 2

1. Detection of other oils in coconut oil.
2. Detection of artificial colour in turmeric powder.
3. Detection of extraneous matterin whole spices.
4. Detection of colored dry tendril of maize cob in saffron.
5. Detection of white powder in iodised salt.
6. Differentiation of common salt and iodised salt.
7. Detection of clay in coffee powder.
8. Detection of Rhodamin B in sweet potatoes.
9. Detection of wax polishing on apple.

Learning Outcomes:

- Students will be able to identify common food adulterants using basic tests.
- They will gain hands-on experience in food quality analysis.
- They will understand the impact of adulteration on health and safety.
- They will be equipped to educate others about food adulteration and preventive measures.

Books recommended for Practicals

1) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
2) Bacteriological techniques by F. J.Baker.
3) Introduction to Microbial techniques by Gunasekaran.

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

SEC Practical –I: Fundamentals of Biochemical Techniques

Unit 1 Biochemical reagents and solutions **No. of Hours: 18**

Safety practices in the laboratory. Preparation and storage of solutions. Concepts of solution concentration and storing solutions. Quantitative transfer of liquids. Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter.

Exercise

Preparation of a buffer of given pH and molarity.

Unit 2 Spectrophotometric techniques **No. of Hours : 6**

Principle and instrumentation of UV-visible and fluorescence spectroscopy.

Exercises

Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule).

Measurement of fluorescence spectrum.

Determination of concentration of a protein solution by Lowry/BCA method.

Unit- 3 Introduction and importance of virtual labs in biochemistry **No. of Hours: 6**

SUGGESTED READINGS

1. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.

2. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

3. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

VSC I: Fundamentals of Dairy Technology

Objective:

- To impart knowledge of microbial and chemical quality of milk.
- To develop the skills in dairy technology

Group I

1. Introduction to Quality Assurance in milk and milk products
2. Measurement of titrable acidity of milk
3. Grading of milk by dye reduction test
4. Microbiological examination of raw milk by DMC
5. Microbiological examination of raw milk by SPC
6. Detection of faecal contamination of milk and milk products
7. Adulteration in milk and milk products
8. Detection of neutralizer in milk
9. Detection of urea in milk
10. Detection of thickening agent in milk

Group II

1. Detection of preservative in milk
2. Detection of neutralizer in milk
3. Detection of adulterants in milk products
4. Determination of efficiency of pasteurization
5. Tests for detection of mastitic milk
6. Determination of fat and SNF content in milk
7. Determination of specific gravity of milk.
8. Preparation of Lassi
9. Preparation of flavoured milk
10. Visit to milk product development centre

SUGGESTED READINGS

1. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.
2. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.
3. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-IV

Biochemistry Paper- VII

DSC-VII: Immunochemistry

Objectives-

- Students will gain an overview of the immune system including cells, organs and receptors
- Student will importance of antigen-antibody interaction in disease diagnosis.

	Paper-VII DSC-VII: - Molecular Biology-I	
	Credit-I	
	Genes and genomic organization - Genome sequence and chromosome diversity, definition of a gene, organization of genes in viruses, bacteria, animals and plants. Nucleosome structure and packaging of DNA into higher order structures **Replication of DNA** The chemistry of DNA synthesis, DNA polymerase, the replication fork, origin of replication, enzymes and proteins in DNA replication, various modes of replication, stages of replication of E. coli chromosome. Mechanism of prokaryotic transcription	15
	Credit- II	
	Translation: Mechanism of prokaryotic translation Genetic code Regulation of gene expression, with operon concept (E.coli lac operon model) **Mutations:** Types of mutations - transition, transversion, frame shift mutations, mutations induced by chemicals, radiation, transposableelements, Repair of DNA damage - direct repair, base excision repair, nucleotide excision repair, and recombination repair Ames test.	15

Learning outcomes-

Students should gain knowledge about

- Basic concepts of foundation of Molecular Biology
- Application of Molecular Biology

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-IV

Biochemistry Paper- VIII

PAPER IV DSC-VIII – Bioinformatics and Biochemical Techniques 2

Objectives-

- Students will acquire the skills necessary for accurate and precise measurements, sample preparation, and data analysis in a biochemical laboratory setting.
- Develop an understanding of fundamental laboratory techniques used in biochemistry, including spectrophotometry, chromatography, and electrophoresis.

PAPER IV DSC-VIII– BIOCHEMICAL TECHNIQUES-2		
	Credit-I	
	Bioinformatics: - Introduction to bioinformatics, Databases, Information sources (NCBI, GDB, and MGD), Data retrieval tools (ENTREZ, OMIM and PubMed), Database similarity searching (BLAST), Applications of Bioinformatics. **Cell Homoginization and Centrifugation:** Principle of differential centrifugation. Types of Rotors, Ultra centrifuge – construction and applications in subcellular fractionation. **DNA sequencing** - DNA sequencing by Sanger's method, modifications based on Sanger's method. Automated DNA sequencing. Pyrosequencing.	15
	Credit- II	
	Radiochemistry: Natural and artificial radioactivity, characteristics of radioactive elements, units of radioactivity, disintegration constant, half-life, α, β and γ radiation. Detection of radioactivity by GM counter. Applications of radioisotopes – 3H, 14C, 131I, 60Co and 32P. Biological effects of radiations. Safety measure in handling radio isotopes. **ELISA** **Enzyme immobilization: -** A. Definition, classification B. Types – i) Adsorption, ii) covalent binding, iii) intermolecular cross linking, iv) Entrapment (gel) C. Industrial applications of immobilization.	15

Learning Outcomes-

Students should gain knowledge about

- Bioinformatics tools
- Basic components of biochemical techniques.
- Methods of Centrifugation and Immobilization.

Reference books: -

1. Nelson, D.L. and Cox, M. M. (2009). Lehninger`s Principles of Biochemistry
2. Biochemistry - Lubert Stryer.
3. Introduction to Chromatography theory and practice - Shrivastava.
4. Chromatography - B.K. Sharma.
5. Biophysical and biochemical technique: Nath and Upadhya
6. Fundamental of Biochemistry: A.C. Deb·
7. Textbook of Biochemistry: Jain & Jain

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-IV Biochemistry

Practical Course-IV -Analytical Biochemistry

	Colorimetric estimations:
1.	Estimation of inorganic phosphate by Fiske-Subbarow method. (1)
2.	Estimation of creatinine in urine. (1)
3.	Estimation of glucose from blood, Folin-Wu or o-Toluidine method. (1)
4.	Estimation of RNA by Bial's orcinol method. (1)
5.	Estimation of urea from blood by DAM method.(1
	Qualitative Analysis
6.	Determination of blood groups.
7.	Detection of normal and abnormal constituents of urine.
8.	Qualitative analysis of saturated and unsaturated lipids. (2)
	Isolations
9.	Amino acid Separation by 2-D Chromatography
10.	Isolation of DNA (1)
	Demonstration Experiments
11.	Bioinformatics experiment to determine three-dimensional structure of proteins by visualizing softwares- RasMol.

Practical outcome-

4. The students will get detailed and comprehensive knowledge on the various practical aspects of biochemical techniques.
5. The students will be able to analyze biochemically different biological samples.
6. Students will get practical knowledge regarding preparation of biochemically important buffers, estimating the biomolecules in each sample by using standard analytical techniques.

Books recommended for Practicals

8) Stains and Staining procedures by Desai and Desai.
9) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
10) Bacteriological techniques by F. J.Baker.
11) Introduction to Microbial techniques by Gunasekaran.
12) Biochemical methods by Sadashivan and D.Manickam.
13) Laboratory methods in Biochemistry by J.Jayaraman.
14) Experimental Microbiology – Patel &Patel

List of the Laboratory equipment:

1. Colorimeter
2. pH meter
3. Electrophoresis apparatus
4. Computer with printer.
5. Water bath / Incubator
6. Mixer
7. Oven
8. Chemical balance / Single pan balance
9. Suction pump
12. Centrifuge machine
13. Heating mantle with magnetic stirrer
14. Soxhlet extraction apparatus.
15. Micropipettes
16. Glassware

- **OTHER FEATURES:**

(A) LIBRARY:

References and Text Books, Journals and Periodicals, Reference Books. – List Attached

(B) LABORATORY SAFETY EQUIPMENTS:

1) Fire extinguisher
2) First aid kit
3) Fumigation chamber
4) Stabilized power supply
5) Insulated wiring for electric supply.
6) Good valves & regulators for gas supply.
7) Operational manuals for instruments.
8) Emergency exits

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

OE Practical –IV: Practical Course in Biochemical Analysis and Microscopy Marks-50

Objectives:

- Develop basic laboratory skills in chemical and biological analysis.
- Understand and apply biochemical techniques for testing substances.
- Enhance observation and analytical abilities through hands-on experiments.

Group I

1) Acid-base identification with some domestic example.
2) Identification of Acidicity and basicity of water.
3) Making of different pH solution
4) Isolation of starch
5) Isolation of Casein
6) Blood group identification (Using kit)
7) Study of simple microscope
8) Study of compound microscope

Group II

1) Study of mitosis slide
2) Study of meiosis slide
3) Study of Glucose ozone crystal
4) Identification of starch (Spot test)
5) Identification of Protein (Spot test)
6) Identification of fat (Spot test)
7) BMI calculation
8) Introduction to dietary fibers

Outcomes:

- Identify acids, bases, and biomolecules using chemical tests.
- Use microscopes to study cell structures and division.
- Analyze water pH, BMI, and dietary components.
- Understand principles of biochemical and physiological assays.

Books recommended for Practicals

1) Introduction to Practical Biochemistry by D. Plummer, J Wiley and Sons.
2) Bacteriological techniques by F. J.Baker.
3) Introduction to Microbial techniques by Gunasekaran

SHIVAJI UNIVERSITY, KOLHAPUR.

B. Sc. - 2 NEP Syllabus with effect from June, 2025

B. Sc. Part – II Semester-III

SEC Practical –II:

PROTEIN PURIFICATION TECHNIQUES

TOTAL HOURS: 30 CREDITS: 2

Unit 1 Purification and characterization of a protein from a complex mixture (native or heterologously expressed) involving the following methods/techniques No. of Hours: 24

Exercises

Preparation of the sample.

Ion-exchange chromatography.

Gel filtration chromatography.

Affinity chromatography.

Electrophoresis.

Unit 2 Demonstration of High Performance Liquid Chromatography (HPLC) No. of Hours: 6

SUGGESTED READINGS

1. Physical Biochemistry: Principles and Applications (2010) 2nd ed., Sheehan, D., Wiley Blackwell (West Sussex), ISBN:978-0-470-85602-4 / ISBN:978-0-470-85603-1.

2. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1982) 2nd ed., Freifelder, D., W.H. Freeman and Company (New York), ISBN:0-7167-1315-2 / ISBN:0-7167-1444-2.

3. An Introduction to Practical Biochemistry (1998) 3rd ed., Plummer D. T., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10:

Nature of Question Paper
for B.Sc. Part – I, II & III (40 + 10 Pattern) according to Revised Structure as Per NEP – 2020 to be implemented from academic year 2025-26

Day and Date: **//**** Total Marks: 40**
Time: **: Duration: 1:30 hrs**
Instructions: 1. All questions are compulsory
2. Draw neat labelled diagrams wherever necessary
3. Figures to the right indicate full marks

Q. 1 Select the most correct alternate from the following [8]

i) to viii) MCQ one mark each with four options

A) B) C) D)

Q.2 Attempt any TWO of the following [16]

A)

B)

C)

Q. 3 Attempt any FOUR of the following [16]

a)

b)

c)

d)

e)

f)

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B.Sc. I Syllabus (NEP-2020)
To be implemented from June 2025 onwards
Nature of Practical Examination
Total Marks 50

1. Practical examination will be conducted semester wise.
2. Practical examination will be conducted for one day per batch.
3. The examination will be conducted in two sessions per day and each session will be of three hours duration.
4. Every candidate should perform one experiment each from Group I and Group II.
5. At least eighty percent practical should be completed by the student.
6. The marks distribution for practical is as below

   Note:- At least 80% Practical should be covered in practical examination.

For Semester III

Sr.No.	Experiments	Marks
1	Enzymology (Major)	15
2	Enzymology (Minor)	10
3	Volumetric Estimation	15
4	Viva-voce	05
5	Journal	05
	Marks	**50**

For Semester IV

Sr.No.	Experiments	Marks
1	Colorimetric estimation	15
2	Qualitative analysis	10
3	Isolations	15
4	Viva-voce	05
5	Journal	05
	Marks	**50**