SHIVAJI UNIVERSITY, KOLHAPUR.

Revised Syllabus For

B.Sc. II Biochemistry IDS (CBCS)
(Sem - III & IV)

A

Accredited By NAAC

Syllabus to be implemented from June 2019 onwards.

Course Outcomes: Department of Biochemistry

Cell Biochemistry

CO1: Be able to define the structure and colligative properties of water, concept of pH, physiologically important buffer system and its regulation.

CO2: Relate to the concepts of various types of bonds, bond length, bond energy and generation and utilization of energy rich molecules like ATP. Chemical foundation of life.

CO3: Be able to analyze Gibbs free energy enthalpy and entropy, applications of laws of thermodynamics in living systems.

CO4: Describe basics of evolution of biomolecules with reference to Miller's experiment, evolution of prokaryotes and eukaryotes.

CO5: Illustrate and relate to the detailed physiology of i) Digestive system; ii) Liver; iii) Heart and iv) Kidney.

CO6: Describe cell biology with special reference to cell organization of prokaryotic and eukaryotic cells. Structural and functional capitalization of cell-mitochondria, chloroplast, lysozymes, Golgi bodies, plasma membrane and cytoskeleton, cell wall and nucleus

CO 7: Explain details of Cell cycle and cell division, chromosome and genetic information storage.

Cell Biology, Microbiology and Virology

CO1: Classify the prokaryotic and eukaryotic cell and define functions of each and every cell organelle.

CO2: Study the cell cycle in details.

CO3: Study the structure, classification and general characteristics of bacteria and viruses.

CO4: Study different methods in microbiology.

CO5: Experiment with microbial growth dynamics.

Proteins – Structure and Functions

CO1: Describe general metabolism scheme of amino acids, proteins and urea cycle

CO2: Evaluate techniques for studying primary sequence of proteins, experimental methods, end group analysis.

CO3: Explain dynamics of protein folding and role of molecular chaperones.

CO4: Demonstrate chemical synthesis of peptides/ solid phase automated synthesis.

CO5: Interpret protein evolution, convergent and divergent trees and illustrate Protein turnover

CO6: Describe vitamins as coenzymes and cofactors, sources, requirements, functions and deficiency symptoms of water soluble vitamins, structure and biochemical role.

Biomolecules

CO1: Be able to demonstrate the structural and functionalrole of biomoleculesessential for cellular reactions.

CO2: Illustrate the catalytic mechanisms involved in synthesis of chemical energy from biomolecules.

CO3: Explain the physiological significance of anabolic and catabolic pathways used to drive cellular functions.

CO5: Enlist the chemical and biologicaldifferencesbetween DNA, RNA and theirrole in cellular behavior.

CO6: Summarize the central dogma of molecular biology and how mutations in DNA can alter cell performance.

Biostatistics and Bioinformatics with Computer Orientation

CO1: Describe measures of central tendency and dispersion.

CO2: Apply probability and distribution.

CO3: Analyse bivariate data, hypothesis testing.

CO4: Describebasics of computers, programming languages and application software.

CO5: Be able to relate to bioinformatics, databases, databank search, data mining, data management and interpretation.

CO7: Summarise genomics and proteomics.

Enzymology

CO1: Classify of enzymes and explain the structural – functional co-relation of enzymes

CO2: Illustrate the fundamental mechanism of enzyme activity through activation energy, binding energy and complementarity between enzyme active site and transition state

CO3: Detailed study of enzyme catalysis which includes factors affecting catalytic efficiency - proximity and orientation effects , distortion or strain, acid – base, nucleophilic catalysis, metal ion catalysis and covalent catalysis

CO 4: Interpret enzyme kinetics including types of enzyme inhibitions and their role in chemical modification.

CO5: Analyze he structure function relations in various enzymes and basics of enzyme regulation.

CO6: Apply the process and commercial applications of immobilized enzymes.

Molecular Biology

CO1: Explain the structure and organization of genome in the cell.

CO2: Illustrate characterization of DNA using different techniques.

CO3: Explain various types of Mutation.

CO4: Compare and contrast the basic DNA replication/ DNA recombination/ DNA repair process.

CO5: Illustrate basics of transcription process and transcription regulations.

CO6: Describe the process of Protein Synthesis and protein transport.

Bioenergetics

CO1:Demonstrate the metabolic processes through which the energy is produced and utilized.

CO2: Get knowledge of redox couples and redox potentials.

CO3: Compare oxidative phosphorylation and photophosphorylation at molecular level.

CO4: Elucidate the inhibition of electron transport chain by various inhibitors.

CO5:Be able to study chemical nature of different hormones, how they influence biomolecular and cellular functions.

CO6: Illustrate the process of nitrogen fixation

Tools and Techniques in Bioscience

CO1: Illustrate the general scheme for purification of bio-components.

CO2: Describe different methods utilized for isolation of different cell organelles, subcellular fractions and marker enzymes.

CO3: Demonstrate various chromatography techniques: ion-exchange, gel filtration, partition, affinity, HPLC and reverse phase chromatography, gas chromatography, TLC, Paper chromatography, Chromatofocussing.

CO4: Study of centrifugation technique: Ultracentrifugation - density gradient centrifugation and molecular weight determination.

CO5: Describe electrophoresis with respect to basic techniques, poly acrylamide/ starch/ agarose gel electrophoresis, use of SDS/urea, isoelectric focusing, capillary electrophoresis. Pulse field gel electrophoresis.

CO6: Describe principles and applications of tracer techniques in biology, measurement of alpha, beta and gamma radiations, radiation dosimetry, radioactive isotopes and half life of isotopes, autoradiography, cerenkov radiation, liquid scintillation spectrometry.

CO7: Experiment with study of X-ray diffraction, fluorescence, UV, visible, CD/ORD, ESR, NMR and Mass spectroscopy, atomic absorption spectroscopy, plasma emission spectroscopy and microscopy.

Genetic Engineering

CO1: Explain the function of restriction endonucleases.

CO2: Analyze the importance of plasmids and viruses in genetic engineering.

CO3: Be able to apply the techniques of selection and screening of clones.

CO4: Explain how to construct the DNA libraries and how to screen for clones that contain a desired gene fragment.

CO5: Describe the process polymerase chain reaction (PCR) and demonstrate its application.

CO6: Illustrate the applications of recombinant DNA technology

Immunochemistry

CO1: Classify fundamentals and anatomy of immune system.

CO2: Have clarity about innate immune system, physiological anatomical and cellular components of innate mechanisms – complement fixation, phagocytosis and toll like receptors.

CO3: Be able to explain genetic basis of antibody structure and generation of antibody diversity.

CO4: Demonstrate the role of MHC I and MHC II in antigen presentation and the concept of MHC polymorphism

CO5: Imbibe the concept of B and T cell maturation and activation and generation of cytokines.

CO6: Explain the basis of hypersensitivity, immune deficiency and autoimmune diseases.

CO7: Be able to apply the principles of immunological techniques, viz. immunoprecipitation, immunoelectrophoresis, ELISA, RIA, FACS, Western blot, Hybridoma technology, generation and applications of monoclonal antibodies.

Biomembranes& Cytoskeleton

CO1: Classify the structure of biomembranes illustrate the significance of and fluid mosaic model

CO2: Describe basics of Protein targeting.

CO3: Be able to relate to transport of various biomolecules across biomembrane, and concept of active passive, facilitated and receptor mediated endocytosis

CO4: Classifycellular cytoskeleton, Interplay of microtubule, micro filaments and intermediary filaments.

CO5: Demonstrate cell signaling, Details of G protein family, adenyl cyclase, cAMP, cGMP, CRE and CREB proteins

Fermentation Technology-I

CO1: Be able to demonstratemicrobial cell growth, kinetics and Strain improvement by mutation, overproduction of metabolites

CO2: Describe development of innocula and production media for industrial fermentation.

CO3: Utilize the process and instrumentation involved in fermentation operations including computer controlled operations.

CO4: Apply the process of batch, fed-batch and continuous fermentation, scale up and scale down of processes, types of fermenters and economics involved in the process.

CO5: Detailed description of down-stream processing: isolation and purification of various metabolites from fermented media.

Research Methodology, Entrepreneurship Development & Tissue Culture

CO1: Demonstrate the basic concept of research, types of research – basic, novel and applied research.

CO2: Be able to formulate research hypothesis, steps in research design, research aptitude, qualities of a researcher and ethics in research – plagiarism.

CO3: Apply the knowledge intellectual property rights in obtaining copyright, trademark, patent.

CO4: Be able to relate to the concept of entrepreneurship development: Small Enterprises, Project Formulation,market survey and research, techno economic feasibility assessment, preparation of preliminary project reports, Government policy for small scale enterprises expansion and diversification.

CO5:Demonstrate good communication skills and be able to frame business letters; technical report writing, minutes of meetings, CV and interview skills.

CO6: Develop detailed concept of Good Manufacturing Practice: Quality assurance, quality management, Quality controland guidelines for microbial and animal cell cultivation and animal usage.

CO7: Be able to demonstrate techniques involved in plant and animal cell and tissue culture: Techniques involved and industrial and clinical applications of PTC and ATC.

Neurochemistry and Carcinogenesis

CO1: Demonstrate organization of human nervous system, chemical composition of brain and blood – Brain barrier.

CO2: Beable to relate the process of Neurotransmission process and mechanism of axonal neurotransmission. Types of channels

CO3: Describe the concept of neurotransmitters, cholinergic receptors, Agonists and Antagonists and their mode of action and effects.

CO4: Describe mechanism of Learning and memory: Long Term Potentiation, NMDA and AMPA, retrograde messengers in synaptic transmission, concept of synaptic plasticity.

CO5: Be able to demonstrate molecular basis of Parkinson's disease, Alzheimer's disease, Schizophrenia, Myasthenia gravis and Multiple sclerosis.

CO6: Be able to interpret the role of chemical carcinogens in mutagenesis and molecular mechanism involved in cancer development.

CO7: Summarize different classes and mechanisms of oncogenes and outline changes in cell behavior on transformation

Bioinformatics

CO1: Classifyprotein sequence information, composition and properties and describe types of sequence alignments, gap-penalties, scoring matrices.

CO2: Illustrate various BLAST programmes and their uses.

CO3: Describe homology modeling, prediction of protein structure from sequences.

CO4: Explain Human Genome project, approaches to gene identification using structural biology, molecular modeling methods.

CO5: Describe molecular docking, molecular dynamics simulations, phylogenetic analysis and software

CO 6: Describe concept of microarrays, techniques and applications of microarray technology.

Fermentation Technology– II

CO 1: Be able to demonstrate basics ofindustrial applications of fermentation technology.

CO 2: Gain the knowledge of fermentation processes involved in pharmaceutical biotechnology ethanoloc beverages; organic acids; Amino acids, Extracellular enzymes, Vitamins, Extracellular polysaccharides andAntibiotics

CO 3: Study of the processes involved in production of therapeutic proteins

CO4: Describe production of industrially important secondary plant metabolites, bioinsecticides, bioplastics, biogas etc.

CO5: Apply the role of bioremediation in petroleum industry, Bioleaching / Biomining, Biotechnological applications of extremophiles, Waste treatment, Microbial desulphurisation of coal

CO 6: Discuss Intellectual Property Rights: Patent : Criteria for patentability, Indian patent act, Role of patent in R & D.

Program Outcomes for M. Sc. in Biochemistry

PO1: Students should have gain knowledge in fundamental concepts Biochemistry. The graduate should also get sufficient knowledge of the applied subjects like Genetic Engineering, Fermentation Technology, Tools and Techniques in Biosciences, Bioinformatics etc.

PO2: Student should become well versed with the qualitative and quantitative evaluation of various biomolecules, enzyme assays, isolation, purification and characterization of biologically important proteins along with various techniques like PCR, gene cloning and transformation used in the field of Molecular Biology and Clinical Biochemistry. He/she also should be able to utilize the knowledge of bioinformatics in the field of protein structure prediction and molecular modeling.

PO3: Candidate should gain capability of handling independent research projects through planning and successful execution of the experiment and be able to analyze of the data obtained using modern technological tools and should inculcate lifelong learning to keep up with advances in the subject.

Program Specific Outcomes for M. Sc. in Biochemistry

PSO1: Generate a manpower having fundamental knowledge of Biochemistry and its applications in the field of i) Enzymology; ii) Molecular Biology; iii) Tool and Techniques in Biosciences; iv) Clinical Biochemistry; v) Immunology; vi) Fermentation Technology, Biomembranes and Neurochemistry

PSO2: Development of confident human resource capable taking up the jobs in academics and teaching, corporate organizations like industries, contract research organizations etc. in the fields like pharmaceuticals, cosmetics, food, forensic sciences and molecular biology etc.

PSO3: Developing a candidate with a confidence of being successful in various competitive examinations like NET, SET, GATE, GRE, TOFEL etc. and proceed for a research career. Groom and encourage the students to be entrepreneur in life sciences products having applications in the area of food, health, cosmetics, agriculture etc. and be able to solve regional problems.

Department of Biochemistry
Shivaji University,
Kolhapur

Vision and Mission of the Department

Mission

To prepare students for undertaking academic roles, research, industrial jobs and entrepreneurship in the area of Biochemistry.To enhance their knowledge and gain deep insights into every aspect of the subject and its applicability. To generate a strong human resource that can contribute innovatively to the above goals.

Vision

To develop into a center for excellence in teaching and research of biochemistry in Western Maharashtra. To attain excellence in the area of Diabetes, Phytoremediation, Bioinformatics, Oxidative stress and aging, neuro degenerative diseases and microbial enzymes in terms of publications, application oriented research and contribute to deeper understanding of the subject.

B. Sc. - II Biochemistry
SEMISTER - III
Paper – I: Biomolecules

UNIT - 1. (15)

Carbohydrates:-

A. Definition, Classification and brief account of …Monosaccharides (aldoses and ketoses):

Trioses – Glyceraldehyde, Dihydroxyacetone

Tetroses – Erythrose, Erythrulose

Pentoses – Ribose, Xylose, Ribulose, Xylulose

Hexoses – Glucose, Galactose, Fructose

Conformations of glucose: alpha & beta

Reactions of anomeric hydroxyl group viz. Fehling test and

Phenyl hydrazine test.

Disaccharides: Glycosidic bond, Maltose, Isomaltose, Lactose, Sucrose & Cellobiose (Emphasis must be on nature of linkage, reducing properties and hydrolysis studies with acid and enzymes.)

Polysaccharides: Structure and biological role of Starch, Glycogen, Cellulose

B. Mucopolysaccharides: Hyaluronic acid, Heparin

Amino Acids:-

A.Definition, Nomenclature

Structure and classification of amino acids:

Neutral amino acids: Hydrocarbon chain amino acids - Glycine, Alanine, Valine, Leucine, Isoleucine

Hydroxy amino acids - Serine, Threonine

Sulphur containing amino acids - Cysteine, Methionine

Aromatic amino acids - Phenylalanine, Tyrosine, Tryptophan

Heterocyclic amino acids – Proline

Acidic amino acids and their amides: Aspartic acid, Glutamic acid, Asparagine, Glutamine

Basic amino acids: Lysine, Arginine, Histidine

B. Zwitterion and isoelectric pH

C. Ninhydrin reaction and its significance

UNIT – II **(15)**

Proteins:

A.Definition, Classification (based on function)

B.Peptide bond and its nature.

C.Structural studies of proteins – i) Primary structure ii) Secondary structure iii) Tertiarystructure iv) Quaternary structure

D.Forces involved in maintaining different structural levels of proteins.

E.Structure and function of oxytocin and myoglobin

F.Amino acid sequencing – a) Significance b) Sequencing methods:- Reaction, advantage &disadvantage of i) Sanger, ii) Edman methods

Enzymes:

A.Definition, Explanation of terms – Holoenzyme, Apoenzyme, Coenzyme,Prosthetic group, Cofactor

B.Classification of enzymes into in to six major classes with one example of each class, Enzyme as catalyst (concept of activation energy in enzyme catalysed reaction)

C.Units of enzyme activity, Specific activity, Turnover number

D.Active site of enzyme and its features

E. Theories of mechanism of enzyme action - Lock and key and induced fit theory

F. Factors affecting enzyme activity - substrate concentration, pH, temperature

G. Enzyme kinetics - derivation of michaelis menten equation, significance of Km and Vmax,

H. Enzyme inhibition - competitive, non-competitive inhibition

I.Isoenzymes of LDH and its clinical importance

L i p i d s

A. Definition and classification of lipids with two examples of each class

B. Fatty acids – Properties, Classification, Essential & non-essential fatty acids.

C. A brief account of structure and functions of…

I)Simple lipids : triglyceride and fatty acids

II)Compound lipids : Phospholipids, viz. lecithin, cephalin, phosphatidylserine, sphingomyelin, glycolipids (cerebrosides & gangliosides)

III)Derived lipids : steroids (cholesterol).

D. Lipid bilayer and Fluid mosaic model of membrane.

Paper –II
(Metabolism and Nutrition)

UNIT- I **(15)**

Biological oxidation:

A.High-energy compounds and their significance viz. ATP, PEP, 1,3-DPG

B.Mitochondrial respiratory chain, components & carriers of ETC ,Inhibitors of ETC

C.Mechanism of oxidative phosphorylation (chemiosmotic hypothesis)

Vitamins and coenzymes:

Definition, classification & Biochemical functions of water soluble vitamins viz. Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic acid

Carbohydrate metabolism:

A.Glycolysis and its significance.

I) Aerobic glycolysis:-glucose to pyruvate synthesis and its energeticsAnaerobic II) glycolysis:-glucose to ethanol synthesis and its energetics

B. Oxidation of pyruvate to acetyl CoA, PDH complex

C. TCA cycle and its energetics

D. Glycogenesis and Glycogenolysis

UNIT – II **(1 5)**

Lipid metabolism:

A. ß- oxidation of fatty acid (Palmetic acid) and its energetic & significance

B. Biosynthesis of fatty acid (Palmetic acid)

C . structure of fatty acid synthatase complex (Eu)

D.Synthesis and utilization of ketone bodies.

Calorimetry and Nutrition:

A. Nutrition, food, nutrient definition, Balanced diet,

B. Caloric value of food stuffs and its measurement (bomb calorimeter).

C. Respiratory quotient

B.Sc.II Biochemistry
SEMISTER - IV
Paper-III
(Biochemical Techniques & Bioinformatics)

UNIT – I **(15)**

C h r o m a t o g r a p h y

Definition and classification Principle, technique and applications of i) Paperii) Thin layer, iii) Ion exchange, iv) Gel permeation chromatography

(The discussion should include selection of matrix, preparation of plates, column packing, sample application, mechanism of separation, important applications and advantages of each one of the methods)

Electrophoresis:

A. Definition of the terms : electrophoresis, electrophoretic mobility

B. Factors affecting electrophoretic mobility

C. Principle, technique and applications of Paper,PAGE and SDS –PAGE (The discussion should include preparation of gel plates, sample application, mechanism of separation, development of plates, important applications and advantages of the method.)

Absorption spectroscopy-

A. Beer Lambert's law, Limitations of Beer Lambert's law

B.Meaning of the terms transmittance, absorbance, molar and specific absorbance

C. Construction, working and applications of i) colorimeter ii) uv spectrophotometer

D.Advantages of spectrophotometer over colorimeter

E.Absorption spectra of proteins, nucleic acids, cytochrome and NAD^+

U N I T I I (15)

Enzyme immobilization:-

A. Definition, classification

B. Types – i) Adsorption, ii) covalent binding, iii) intermolecular cross linking, iv) Entrapment (gel)

C. Industrial applications of immobilization.

Basic Immunology and Techniques:-

A.Natural and acquired Immunology

B.T Cells and B Cells

C. Structure of IgGE. Antigen –antibody interaction

E. Phagocytosis by Macrophages

F. ELISA

Bioinformatics:-

A. Introduction to bioinformatics

B. Databases

C. Information sources (NCBI, GDB, and MGD)

D. Data retrieval tools (ENTREZ, OMIM and PubMed)

E. Database similarity searching (BLAST)

F. Applications

Paper-IV

(Molecular biology & Biotechnology)

UNIT- I **(1 5)**

Nucleic acids:

A. Definition, Types and Distinction between DNA and RNA

B. Chemical composition of nucleic acids i) purines ii) pyrimidines iii) phosphate

iv) Sugars

C.nucleosides and nucleotides

D.Representation of primary structure of polynucleotide chain

E.Watson Crick model of DNA, Structure and functions of mRNA, rRNA andtRNA (yeast)

Molecular biology

A. Mechanism of prokaryotic replication

B. Mechanism of prokaryotic transcription

C. Mechanism of prokaryotic translation of DNA

D. Genetic code

E. Regulation of gene expression, with operon concept (E.coli lac operon model)

Genetic Engineering and Biotechnology:

A.Introduction to Tools and techniques in genetic engineering

i) Enzymes a) Restriction endonucleases- introduction to class I, II and III, eg-

B.EcoRI, Bam HI b) Reverse transcriptase, c) S1 nuclease, d) DNA ligases, e) Alkaline phosphatase

C.Basic concept of gene cloning technique, (include B and C for myself)

D.Principal, working and applications of PCR.

E.Blotting techniques-southern, northern and western blotting and their application,

F.Applications of genetic engineering.

UNIT- II (15)

Biochemistry of Diabetes Mellitus:-

A. Introduction structure of insulin

B.Metabolic effect of insulin

C. Overview of mechanism of action of insulin

D.Explanation of term i) hyper and hypoglycaemia ii) renal threshold value

E. Meaning and type of diabetes mellitus

F. Symptoms of diabetes mellitus

G. Secondary complication of diabetes mellitus i) Nephropathy ii) Retinopathy iii) Neuropathy iv) Cardiovascular disease

(Only overview of the secondary complications)

H.Hyperglycaemic drugs e.g. i) Sulfonylurea ii) Metformin

Biochemistry of AIDS:

A. Structure of HIV,

B. Transmission of HIV,

C. Immunological abnormalities in AIDS,

D. Lysis of CD4 cells,

E. Natural course of AIDS – i) Acute ii) Chronic, iii) Crises phases. Graphical representation,

F. Anti-AIDS drugs – AZT (Zidovudine) & DDI (Didanosine) : their structure and mechanism of action.

List of books

1. Outlines of Biochemistry - Cohn and Stumph
2. Principles of Biochemistry - White, Handler and Smith.
3. Biochemistry - O. P. Agrawal.
4. Text book of Biochemistry - West, Todd and Manson.
5. Biochemistry - Lubert stryer.
6. Text book of Biochemistry and Human Physiology - G .P. Talwar.
7. Harper's Review of Physiological Chemistry - H. A. Harper.
8. Hawk's Physiological Chemistry - Oser.
9. Introduction to Chromatography theory and practice - Shrivastava.
10. Chromatography - B .K. Sharma.
11. Biochemistry - S.C. Rastogi.
12. Text book of Biochemistry - R. C. Dubey.
13. Text book Biochemistry - A. V. S. S. Ramarao.
15. Biochemistry - J.H. Weil.
16. Biochemistry - Zubey.
17. Fundamentals of Biochemistry - Voet,Voet & Pratt.

18. Fundamentals of Biochemistry - J. L.J ain.
19. Biochemistry - U. Satyanarayan.
20. Theory and Problems in Biochemistry - P. W. Kuchel and Ralston.
21. Nutritional Biochemistry - Dr.S.Ramkrishna & Dr. S. Vyankatrao.
22. Cell and Molecular biology - P. K. Gupta.
23. Elements of Biotechnology - P. K. Gupta.
24. A Text Book of Biotechnology – R. C. Dubey.
25. Genetic engineering - Sandhya Mitra.
26. Basic Biotechnology - S.Ignacimuthu.
27. Biotechnology - B. D. Singh.
28. Biotechnology - M. P. Arora.
29. Introduction to Bioinformatics - T. K. Attwood & D. J. Parry- Smith
30. Bioinformatics : Principle and applications - Harshawardhan P. Bal.
31. Immunology .- Kuby.

Practical Course

The practical course is to be covered in two days per week (total eight periods per week). At the end of the year there should be practical examination of 100 marks conducted in two consecutive days for not less than six hours on each day. Figures shown to the right indicate number of practical required.

Practical Course-I

a) Fundamentals of Biochemical analysis. (1)

b) Control and Accuracy. (1)

Separation methods:

Paper chromatographic separation & identification of amino acids from binary Mixture. (1)

Paper chromatographic separation & identification of carbohydrates from binary Mixture(1)

Uptake of Na ions by cation exchange resin.(1)

Isolations :

Isolation and characterization of starch from potatoes. (1)

Isolation and characterization of casein from milk. (1)

Isolation and characterization of albumin from egg. (1)

Colorimetric estimations:

Verification of Beer Lambert's law and estimation of copper sulphate. (1)

Estimation of protein by Biuret method. (1)

Estimation of inorganic phosphate by Fiske-Subbarow method. (1)

Estimation of glucose from DNSA method. (1)

Estimation of RNA by Bial's orcinol method. (1)

Estimation of urea by DAM method. (1)

Practical Course - II

Volumetric Estimations:

Estimation of glycine by formal titration. (1)

Estimation of lactose in milk by Fehling's or Benedict's method. (1)

Estimation of total chlorides in urine by Volhard's method (1)

Estimation of vitamin-C in biological samples & tablet by 2, 6 dichlorophenol indophenol method. (1)

Determination of saponification value of oil. (1)

Immobilization of baker's yeast cells by gel entrapment for invertase activity. (2)

Quantitative Estimation of amylase activity. (2)

Problems on DNA - RNA sequence, Genetic code (2)

Qualitative Analysis

Detection of Carbohydrates -Glucose, Fructose, Lactose, Sucrose, Starch.(3)

Detection of normal and abnormal constituents of urine. (2)

Determination of blood groups. (1)

Detection of enzymes (any four) (2)

Urease, Amylase, Invertase, Phenol oxidase, Alkaline- Phosphatase.

Demonstration Experiments

Bioinformatics experiment to determine three dimensional structure of proteins by visualizing softwares- RasMol. (1)

Extraction of lecithin from egg yolk. (2)

Separation of indicators proteins by gel electrophoresis. (1)

Effect temperature and pH on amylase enzyme (2)

There shall be a study tour for not more than four days to visit industries and institutions of biochemical importance. One teacher will accompany a batch of 16 students. As per university rules T.A. and D.A. should be paid to the teacher.

List of the Laboratory equipments:

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. Micropipetes
16. Glassware

SHIVAJI UNIVERSITY, KOLHAPUR

B.Sc Part II Practical Examination, March/April 20__

The practical examination of B.Sc Part II in Bio-Chemistry will be 12 hours duration and will be conducted in TWO SUCCESSIVE days, 6 hour per day.

The total practical examination will be of 100 marks. The distributions of marks will be as follows.

Sr.No.	Experiments	Marks
1	**Colorimetric estimation**	**14**
2	**Isolation of biological samples**	**12**
3	**Paper chromatography/Separation method**	**12**
4	**Volumetric estimation**	**12**
5	**Qualitative analysis of** **a) Carbohydrate** **b) Enzyme detection** **c) Genetic problems**	**22**
6	**Oral**	**10**
7	**Journal and study tour report**	**15**
	Marks	**100**

The practical batch will be of maximum 16 candidates. The batch will be divided in two sub groups A and B. sub group A will consist of 8 candidates while sub group B will have 8 candidates.

If the number of candidates in batch is less than 16th number should be divided in two equal sub group A and B. Any number remaining will be placed in sub group B.

Practical examination timing 11:00 am to 2:00 pm and
2:00 to 5:30 pm
Recess: 2:00 pm to 2:30 pm

Chairman
B.Sc Part II Bio-Chemistry
Examination, March/April, 20__