

**SRR & CVR GOVERNMENT DEGREE COLLEGE
(AUTONOMOUS)**

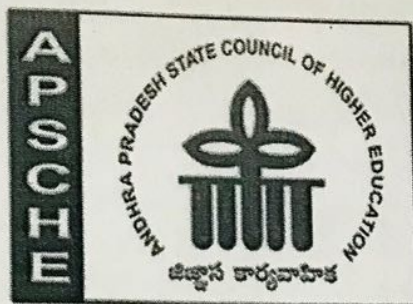
Vijayawada 520004, KRISHNA DISTRICT



Minutes of the Meeting Board of Studies

Department of Biochemistry

Dated: 20-11-2020



**ANDHRA PRADESH STATE COUNCIL OF HIGHER
EDUCATION**

(A Statutory body of the Government of Andhra Pradesh)

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**REVISED SYLLABUS OF B.Sc. (BIOCHEMISTRY)
UNDER CBCS FRAMEWORK WITH EFFECT FROM 2020-21**

PROGRAMME: THREE-YEAR B.Sc.
(BIOCHEMISTRY)

*(With Learning Outcomes, Unit-wise Syllabus, References, Co-curricular Activities
& Model Q.P.)*

For Fifteen Courses of 1, 2, 3 & 4 Semesters)
(To be Implemented from 2020-21 Academic Year)

Structure of BIOCHEMISTRY Syllabus
(Under CBCS for 3-year B.Sc. Programme)

(With domain subject covered during the first 4 Semesters with 5 Courses)

Year	Semester	Courses	Title of the Course	Marks	No.ofHrs/Week	No.ofCredits				
I	I	I	BCH-1 Biomolecules	100	4	03				
			Practical – BCP-101 Qualitative Analysis	50	2	02				
	II	II	BCH-II Analytical techniques	100	4	03				
			Practical – BCP-201 Biochemical Techniques	50	2	02				
II	III	III	BCH-III Enzymology, Bioenergetics and Intermediary Metabolism	100	4	03				
			Practical – BCP-301 Quantitative analysis	50	2	02				
			BCH-IV Physiology, Nutritional and Clinical Biochemistry	100	4	03				
			Practical – BCP-401 Nutritional and Clinical Biochemistry	50	2	02				
	V	V	V	BCH-V Microbiology, Immunology and Molecular biology	100	4	03			
				Practical – BCP-501 Microbiology and Immunology	50	2	02			
				Total No. of Courses: 05 (Five)						

B.Sc. BIOCHEMISTRY SYLLABUS UNDER CBCS

I Year B.Sc.-Biochemistry:1 Semester

Course I: Biomolecules, Code: BCH-1

Work load: 60 hrs. per semester 4 hrs/week

Expected outcomes, On successful completion of this course:

The student gains knowledge in the chemistry of biomolecules such as water, carbohydrates, lipids, proteins and nucleic acids which make up all the living organisms including humans.

This will enable the student to understand the importance of these biomolecules in living organisms and effects of their alterations in diseases occurring in plants, animals and humans.

The practical's will give the expertise to the student for analysis of any biological or non-biological sample for identification of its chemical composition

Unit - I:

1. Biophysical Concepts 12 hours

Water as a biological solvent, Buffers, measurement of pH, electrodes, Biological relevance of pH. pKa value, analysis of drinking water and pond water, Introduction to Different types of waters such as Potable water, Purified Water, Distilled Water, Deionized Water, RO Water, Water for Injection. Different Types of Waters used in the pharmaceutical industry, water for Vaccines. Total dissolved salts (TDS), BOD, COD, soil analysis (texture, organic matter, elements), Electrical conductivity.

Unit - II:

2. Carbohydrates 12 hours

Carbohydrates: Classification, monosaccharides, D and L designation, open-chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde, and ketone. Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides, and Blood group substances. Galactomannans and their applications in modern foods.

Unit - III:

3. Lipids 12 hours

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins- structure, types, and biological role. Lipoproteins- types and functions, Biomembranes- Membrane composition and organization - Fluid mosaic model. Formation of micelles, bilayers, vesicles, liposomes.

Unit-IV:

4. Amino Acids and Proteins 12 hours
Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carboxyl and amino groups. Titration curve of glycine and pK values. Essential and nonessential amino acids. Protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin.

Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation and renaturation of proteins. Secondary organization of proteins - primary, secondary, tertiary, and quaternary structures (Eg. Hemoglobin, Myoglobin). Ramachandran plot.

Unit-V:

5. Nucleic acids and porphyrins 12 hours
Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali, and nucleases on DNA and RNA. Structure of nucleic acids - Watson-Crick DNA double helix structure, denaturation and renaturation kinetics of nucleic acids, T_m -values and their significance, Cot curves and their significance.

Structure of porphyrins: Identification of Porphyrins, Protoporphyrin, porphobilinogen. Structure of metalloporphyrins - Heme, cytochromes and chlorophylls.

Practical Course 1: Qualitative Analysis

Work load: 30 hrs. per semester

3 hrs.

Practical BCP- 201

List of experiments:

Preparation of buffers (acidic, neutral and alkaline) and determination of pH.

1. Qualitative identification of carbohydrates - glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
2. Qualitative identification of amino acids - histidine, tyrosine, tryptophan, cysteine, arginine.
3. Qualitative identification of lipids - solubility, saponification, acrolein test, Salkowski test, Liebermann-Burchard test.
4. Preparation of Osazones and their identification.
5. Absorption maxima of colored substances - p-Nitrophenol, Methyl orange.
6. Absorption spectra of protein - BSA, nucleic acids - Calf thymus DNA.

Recommended books:

1. Soil Testing Manual by Dr. G. S. Wagh.
2. Soil Testing and Plant Analysis: Part I Soil Testing, Volume 2. SSSA Special publications by W. Hardy.
3. Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter.
4. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.

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- Proteins: A guide to study by physical & chemical methods, Haschemeyer and Haschemeyer,
Proteins: Structure, function and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.
Biochemistry - Zubay C, Addison – Wesley, 1986.
Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
Biochemistry, Lehninger A.H.
10. Textbook of Biochemistry West, E.S., Todd, Mason & Vanbruggen, Macmillian&Co.
11. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill.
12. Organic chemistry, I.L. Finar, ELBS. (1985).
13. Organic Chemistry by Morrison and Boyd (2000) Prentice Hall.
14. Fundamentals of Biochemistry by Donald Voet (1999).
15. Indian Pharmacopeia available in the pharmacy department

B.Sc. BIOCHEMISTRY SYLLABUS UNDER CBCS

I Year B.Sc.-Biochemistry: II Semester

Course II: Analytical techniques, Code: BCH-II

Work load: 60 hrs. per semester 4 hrs/week

Expected outcomes of the course BCH- II

The student will learn the various analytical techniques and their applications in separation and isolation of cells and tissues for studying their functional abnormalities

The knowledge in the analytical techniques will enable the student for isolation, purification and chemical characterization of compounds from plants and microbes which will have medical or commercial importance.

The practical's will provide the expertise to the student for quantification of electrolytes and other metal ions, hormones and identification of bacteria.

The expertise gained by the student in this course can be useful in food industries, pharma industries, clinical and microbiological labs.

Unit-I: Cell homogenization and centrifugation 12 hours

Introduction to types of Cells & Cell Lysis, methods of tissue homogenization: (Potter-Elvehjem, mechanical blender, sonicator and enzymatic). Centrifugation techniques, principles and applications- differential, density gradient. Ultra-centrifugation- preparative and analytical.

Unit-II: Chromatographic techniques

12 hours

Types of chromatographic techniques, Principle and applications - Paper chromatography- solvents, Rf value, applications; Thin layer chromatography- principle, choice of adsorbent and solvent, Rf value, applications; Gel filtration, Ion- exchange- principle, resins, the action of resins, experimental techniques, applications, separation of metal ions; Affinity chromatography. Introduction to HPLC

Unit-III: Spectroscopy and tracer techniques

12 hours

Electromagnetic radiation, Beer-Lambert's law. Introduction to Absorption & Emission spectroscopy Colorimetry and Spectrophotometry, spectrofluorimetry, flame photometry. Tracer techniques: Radioisotopes, units of radioactivity, half-life, β , and γ - emitters, use of radioactive isotopes in biology, ELISA, RIA.

Unit-IV: Electrophoresis

12 hours

Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis, isoelectric focusing, immune-electrophoresis-types and applications.

Unit-V: Microbial techniques:

12 hours

Microscopy: Basic principles of light microscopy, phase contrast, electron microscope and fluorescent microscope and their applications.

Preparation of different growth media, isolation and culturing and preservation of microbes, Gram staining- Gram-positive and Gram-negative bacteria, motility and sporulation, Sterilization Techniques
Physical methods, chemical methods, radiation methods, ultrasonic and. Antibiotic resistance. Application
of Sterilization in the food & Pharmaceutical Industry.

Practical Course 2: Biochemical Techniques

3 hrs./week

Workload: 30 hrs. per semester

Practical BCP- 201

List of Experiments:

1. Isolation of RNA and DNA from tissue/culture.
2. Qualitative Identification of DNA, RNA and Nitrogen Bases
3. Isolation of egg albumin from egg white.
4. Isolation of cholesterol from egg yolk.
5. Isolation of starch from potatoes.
6. Isolation of casein from milk.
7. Separation of amino acids by paper chromatography.
8. Determination of exchange capacity of resin by titrimetry.
9. Separation of serum proteins by paper electrophoresis.

Recommended books:

1. Principles and Techniques of practical Biochemistry. Eds. Williams and Wilson.
 2. Techniques in Molecular biology Ed. Walker & Gastra, Croom Helm, 1983.
 3. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980.
 4. An introduction to spectroscopy for Biochemistry. Ed. Brown S.N., Academic press
 5. Analytical Biochemistry, Holmes and Hazel peck, Longman, 1983.
 6. An introduction to practical biochemistry. David T. Plummer, Tata Mac Grew-Hill.
 7. Biophysical chemistry, Edshall & Wyman, Academic press Vol. II & I.
 8. A textbook of quantitative inorganic analysis including elementary instrumental analysis, Vogel
- ELBS.
9. Biochemical calculations Seigel, IH, 2nd Edit, John Wiley & sons Inc., 1983.
 10. Analytical Biochemistry by Friefelder David