ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

I SEMESTER  **BIOCHEMISTRY** TIME:4HRS/WEEK

BCH 1802 (3) **BIOMOLECULES** MARKS:100

w.e.f. 2021-2022 admitted batch (21AI) **SYLLABUS**

**OBJECTIVES : To enable the students to-**

* Use various solvents, prepare different types of buffers based on need
* Identify and classify carbohydrates based upon their properties.
* Identify lipids and understand their physiological role
* Learn and interpret the various organizations of protein structure
* Correlate knowledge on nucleic acids with their physiological role and analyze quality of porphyrins and appreciate their biological significance

**COURSE OUTCOMES: Students will be able to**

**CO1:** Correlate the Physico – Chemical properties of Bio molecules to their structures

**CO2**: Compare and contrast the structure and functions of oligosaccharides and polysaccharides

**CO3:** Identify and establish thefunctional groups of Biomolecules such as CarbohydratesandLipids

**CO4:** Explain the structure of peptide bond formation, and levels of protein structure

**CO5:** State the central dogma of molecular biology; recognize the structure of nucleic acids compare and contrast- DNA and RNA

**UNIT- I: BIOPHYSICAL CONCEPTS :** Water as biological solvent, Buffers, measurement ofpH, electrodes, Biological relevance of pH, pKa value, analysis of drinking water and pond water, Total dissolved salts (TDS), BOD, COD, soil analysis (texture, organic matter,elements), Electrical conductivity.

**UNIT - II: 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 biologicalimportance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and blood group substances.

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

BCH 1802 (3) ::2::

**UNIT-IV: AMINO ACIDS AND PROTEINS: Amino Acids**: Classification, structure, stereochemistry, chemical reactions ofamino acids due to carbonyl and amino groups. Titration curve of glycine and px values. Essential and nonessential amino acids, non-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. Structural organization of proteins- primary, secondary, tertiary and quaternary structures (Eg. Hemoglobin and Myoglobin).

**UNIT-V: NUCLEIC ACIDS AND PORPHYRINS :** 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 properties, Structure of metalloporphyrins–Heme, cytochromes and chlorophylls.

**RECOMMENDED BOOKS:**

1. Soil Testing Manual by Dr. G. S. Wagh.

# Soil Testing and Plant Analysis: Part I Soil Testing, Volume 2, SSSA Special publications by Glenn W. Hardy.

# Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter

1. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
2. Proteins: A guide to study by physical & chemical methods, Haschemeyer and Haschemeyer,
3. Proteins: Structure, function and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.
4. Biochemistry - Zubay C, Addison – Wesley, 1986.
5. Biochemistry, A problem Approach, 2nd Edn. Wood, W.B. Addison Wesley 1981.
6. Biochemistry, Lehninger A.H.
7. Textbook of Biochemistry West, E.S., Todd, Mason &Vanbruggen, Macmillian&Co.
8. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill.
9. Organic chemistry, I.L. Finar, ELBS. (1985).
10. Organic Chemistry by Morrison and Boyd (2000) Prentice Hall.
11. Fundamentals of Biochemistry by Donald Voet (1999).

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ST.JOSEPH’S COLLEGE FOR WOMEN ( AUTONOMOUS ),VISAKHAPATNAM

I SEMESTER **BIOCHEMISTRY** TIME:2HRS/WEEK

BCH 1852 (2) **“QUANTITATIVE ANALYSIS”** MAX.MARKS:50

w.e.f. 2021-2022 admitted batch(20AI) **PRACTICALS**

**OBJECTIVES:** To enable the students to-

* Learn qualitative analysis of monosaccharides and disaccharides
* Prepare buffers as per the need of the experiment
* Analyze amino acids and lipids Qualitatively
* Determine lambda maxima for biomolecules
* Quantitate proteins and DNA using spectrophotometry

**COURSE OUTCOMES- The students will be able to**

**CO1:** Prepare buffers selectively as per the need of the experiment or biomolecule

**CO2:**Differentiate carbohydrate by using qualitative tests

**CO3:**Establish methods to differentiate various amino acids

**CO4:** Analyze the quality of a given oil

**CO5:**Develop absorption spectra for proteins and DNA and quantitate them

**LIST OF PRACTICALS:**

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

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# Soil Testing and Plant Analysis: Part I Soil Testing, Volume 2, SSSA Special publications by Glenn W. Hardy.

# Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter

1. The biochemistry of Nucleic acids; Adams et al., Chapman and Hall, 1986.
2. Proteins: A guide to study by physical & chemical methods, Haschemeyer and Haschemeyer,
3. Proteins: Structure, function and evolution. Dickerson & Geis, 2nd Edn, Benjamin/Cummings.
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6. Biochemistry, Lehninger A.H.
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