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

III SEMESTER **BIOCHEMISTRY** TIME:5HRS/WEEK

BCH 3802 (3) **BIOMOLECULES, ENZYMOLOGY AND BIOENERGETICS** MAX.MARKS:100

w.e.f. 2020-2021 (20AH) **SYLLABUS** 60HRS

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

* Identify and classify amino acids based upon their properties
* 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
* Comprehend basic concepts of enzymology and learn about their commercial applications
* Realize importance of Bioenergetic with respect to physiological processes

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

**CO1:** Describe and recognize amino acid structure, classification, physical and chemical properties

**CO2**: Explain the structure of peptide bond formation, and levels of protein structure

**CO3:** State the central dogma of molecular biology; recognize the structure of nucleic acids compare and contrast - DNA and RNA

**CO4:**.Describethechemicalnatureofenzymes and use appropriate nomenclature

**CO5:**Quantify bioenergetics and elaborate physiological adaptations of plants and animals

**UNIT-I: 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.

**UNIT- II: 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-III: 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.

**UNIT-IV: ENZYMOLOGY :** Introduction to Biocatalysis, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. Active site, Enzyme specificity. Principles of energy of activation, transition state. Interaction between enzyme and substrate-lock and key, induced fit models. Fundamentals of enzyme assay, enzyme units. Outlines of mechanism of enzyme action, factors affecting enzyme activity. Commercial application of enzymes.

**UNIT- V: BIOENERGETICS AND BIOLOGICAL OXIDATION :** Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds. Energy, change, oxidation-reduction reactions.

Organization of electron carriers and enzymes in mitochondria. Classes of electron-transferring enzymes, inhibiters of electron transport. Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.

**RECOMMENDED BOOKS:**

1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001.
2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997
3. Principles of enzymology for food sciences: Whitaker Marc Dekker 1972.
4. Principles of Biochemistry, White. A, Handler, P and Smith.
5. Biochemistry, Lehninger A.L.
6. Biochemistry, LubertStryer.
7. Review of physiological chemistry, Harold A. Harper.
8. Text of Biochemistry, West and Todd.
9. Metabolic pathways – Greenberg.
10. Mitochondria, Munn.
11. Biochemistry, 2nd Edition, G. Zubay.

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

III SEMESTER **BIOCHEMISTRY**  TIME:3HRS/WEEK

BCH 3852 (2) **“QUANTITATIVE ANALYSIS”** MAX.MARKS:50

w.e.f. 2020-2021 (20AH) **PRACTICALS** 45 hours

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

* Learn basic concepts of enzyme assays
* Identify the various factors that regulate enzyme catalysis
* Qualitatively and quantitatively carbohydrates
* Determine the concentrations of amino acids and proteins
* Extraction of nucleic acids and their estimation

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

**CO1:** Ableto assaydifferenttypesofEnzymes

**CO2:**Determinetheactivityof enzymesby varying physical and chemical variables

**CO3:**Establish the parameters that influence enzyme activity

**CO4:** Estimate nucleic acids like DNA and RNA in biological specimens like forensics sciences

**CO5:** Develop hands on experience in estimation of proteins which is required in medical lab diagnostics

**COURSE:**

1. Assay of amylase.
2. Assay of urease.
3. Assay of catalase
4. Effect of pH, temperature and substrate concentration on enzyme activity.
5. Estimation of glucose by DNS method.
6. Estimation of glucose by Benedict’s titrimetric method.
7. Estimation of total carbohydrates by Anthrone method.
8. Isolation of DNA from onions and its quantification
9. Estimation of amino acid by Ninhydrin method.
10. Estimation of protein by Biuret method.

**RECOMMENDED BOOKS:**

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4. Principles of Biochemistry, White. A, Handler, P and Smith.
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