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

III SEMESTER **BIOCHEMISTRY** TIME:4Hrs/Week

BCH 3803(3)**Enzymology, Bioenergetics and Intermediary metabolism** Max.Marks:100

w.e.f. 21AI Batch  **SYLLABUS**

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

* Comprehend basic concepts of enzymology and learn about their commercial applications
* Realize importance of Bioenergetic with respect to physiological processes
* Sketch the entire carbohydrate metabolism and its energetics
* Comprehend lipid metabolism and its role in human body maintenance
* Explain amino acid metabolism, and Nucleic acid metabolism and interpret its usage in cancer therapy

**Course Outcomes- Students will be able to:**

**CO1:**Describethechemicalnatureofenzymes and use appropriate nomenclature

**CO2**:Quantify bioenergetics and elaborate physiological adaptations of plants and animals

**CO3:** Identify major pathways of carbohydrate and lipid metabolism

**CO4:**.Define major pathways of amino acids metabolisms

**CO5:** Analyze the reasons for various inborn errors of metabolism

**Unit-I: Enzymology**:**12 hours**

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- II: Bioenergetics and Biological oxidation:** **12 hours**

Bioenergetics: 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.

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**Unit-III: Carbohydrate Metabolism:** **12 hours**

Concept of anabolism and catabolism. Glycolytic pathway, energy yield. Fate of pyruvate-formation of lactate and ethanol, Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis. Photosytnthesis- Light and Dark reactions, Calvin cycle, C4 Pathway. Disorders of carbohydrate metabolism- Diabetes Mellitus*.*

**Unit-IV: Lipid Metabolism:** **12 hours**

Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms,Ketogenesis, *DE NOVO* synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes, Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol. Disorders of lipid metabolism.

**Unit-V: Metabolism of Amino acids:** **12 hours**

General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine. Biosynthesis of creatine. Inborn errors of aromatic and branched chain amino acid metabolism.

**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:2Hrs/Week

BCH 3853(2) **“Quantitative Analysis”** Max.Marks:50

w.e.f. 21AI Batch  **PRACTICAL**

**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:**

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.
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