

BIOENERGETICS AND METABOLISM

Unit 1

Bioenergetics: Free energy and entropy changes in biological system, coupling of endergonic and exergonic processes. High energy phosphates and their role in redox reaction. Biological oxidation. Enzymes involved in oxidation and reduction- oxidases, dehydrogenases, hydroperoxidase and oxygenases. Cytochrome P-450 monooxygenases system.

Unit 2

Mechanism of oxidative phosphorylation. Chemiosmotic theory, respiratory chain complexes, oxidative phosphorylation, uncouplers, inhibitors, ionophores. Mitochondrial transport systems. Malate and glycerophosphate shuttles. Membrane bound enzymes in energy production.

Unit 3

Carbohydrate metabolism: Glycolysis and its energetic. gluconeogenesis, oxidation of pyruvate to acetyl CoA, TCA cycle and its regulation, energetics of anaplerotic reactions; Hexose monophosphate pathway, glycogens and glycogenolysis, glucuronic acid cycle; glyoxalate cycle; metabolism of galactose and fructose.

Unit 4

Lipid metabolism: Biosynthesis of fatty acids- biosynthesis and catabolism of triglycerides, phospholipids and glycolipids. Oxidation of fatty acids α , β and γ oxidation; Cholesterol- synthesis, transport degradation and excretion. Ketogenesis; plasma lipoproteins- metabolism.

Unit 5

Protein, nucleic acid and porphyrins metabolism: Deamination, decarboxylation, transamination of amino acids, glycolytic and ketogenic amino acids, urea cycle, biosynthesis and catabolism of amino acids, metabolism of purine and pyrimidine nucleotides. Biosynthesis and degradation of porphyrins, Heme, Bile pigments formation.

References

1. Principles of Biochemistry – Lehninger.
2. Harper's review of Biochemistry-David W. Martin.
3. Biochemistry – Stryer.
4. Biochemistry – Voet & Voet.
5. General Biochemistry – Weil (Wiley Eastern, India).
6. Biochemistry – Mathews.